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CORRECTIONS

The following corrections should be noted in the article
entitled Water and Salt Metabolism by Dr Samuel
Standard published in the October 1938 issue Figure 1
page 303 interstitial fluid should be 15%. Page 310 second
paragraph fourth line should read In this state a normal
human kidney puts out from 60 to 70 c cm of urine an
hour

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SURGERY AND THE BASIC SCIENCES

THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

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VITAMIN A AND DARK ADAPTATION

NIGHT-BLINDNESS, or hemeralopia, has been recognized for centuries to be in many cases the result of dietary inadequacies. Later it was observed that hemeralopia is a constant accompaniment of xerotic conjunctiva. Experimental work with animals demonstrated conclusively that the xerosis is a result of Vitamin-A deficiency. The obvious conclusion that hemeralopia must also be caused by a Vitamin-A deficiency was investigated directly by Fridericia and Holm (1) in 1925. Vision in dim light is largely a function of the retinal rods, which are responsive to light by virtue of a photo-sensitive pigment, visual purple, or rhodopsin, which they contain. Accordingly Fridericia and Holm determined the rate of regeneration of visual purple after exposure to light by rats maintained on a Vitamin-A deficient diet as compared with that in animals maintained on a complete diet. They were able to detect a significant reduction in the rate of regeneration of visual purple in the deficient animals. Holm (2) also showed that such animals had deficient vision in dim light. In 1931 Tansley (3) repeated and confirmed these experiments, establishing a definite relationship between Vitamin A, visual purple, and dark adaptation. In 1935 Wald demonstrated the presence of Vitamin A in certain layers of the retina (4) and proposed his theory concerning the rôle of Vitamin A in the process of vision (5).

According to this theory light decomposes visual purple into two components, a protein, and a prosthetic group called visual yellow or retinene. Further action of light converts visual yellow into colorless compounds, including Vitamin A. In the synthetic portion of the cycle Vitamin A is required for the regeneration of visual purple, in the absence of adequate amounts of available retinene. Thus a deficiency of Vitamin A is reflected as a deficiency in vision. In testing this theory Krause and Sidwell (6) found that Vitamin A is not formed by the action of light on pure solutions of visual purple. As a result the exact rôle of Vitamin A in the intimate processes of vision in the retinal rods remains to be discovered or established.

The fact that in experimental animals a deficiency in visual purple was the earliest manifestation on a diet inadequate in Vitamin A suggested the possible clinical application of measurements of dark adaptation for the detection of mild deficiencies of the vitamin. In recent years a commercial instrument called the "biophotometer," which in principle is based on the Birch-Hersfeld instrument employed during the war, has become available for clinical use. With this instrument Jeans, Blanchard, and Zentmire (7) discovered that a large proportion of school children receive an inadequate intake of Vitamin A. Jeghers (8) made the same observation in adults. Recently however, Griggman and Wilkinson (9) and Palmer and Bloomberg (10) have not been thoroughly

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convinced of the accuracy of the method. Booher and Williams (11) believe it to be satisfactory for the detection of marked dysadaptation but Isaacs, Jung and Ivy (12) have seriously questioned the reliability of the instrument.

Hecht, who has done extensive and careful work in the field of dark adaptation for many years, has constructed an instrument known as the adaptometer which takes into consideration a number of factors neglected in the earlier instruments (Hecht and Shlaer (13)). Using this instrument Hecht and Mandelbaum (14) have followed the changes in dark adaptation in four subjects placed on a Vitamin A deficient diet. Over a period of several weeks dark adaptation was progressively impaired both in the rods and in the cones. Adaptation subsequently returned toward normal when a complete diet was resumed. The fact that adaptation in the cones is also affected by Vitamin A deficiency suggests a relationship between the vitamin and visual violet, a photo-sensitive pigment recently detected by Wald (15) in the retinal cones. Wald, Jegher and Arminio (16) using a

similar adaptometer obtained the same results in one subject maintained on a deficient diet. In this subject the administration of Vitamin A concentrate by mouth restored normal adaptation within approximately 30 minutes; carotene given intramuscularly acted within 7 minutes. Since the body reserves of the vitamin had been depleted this improvement was very temporary. A continued intake of adequate amounts of Vitamin A were required to produce a more lasting effect.

Haig, Hecht and Patek (17) have also reported that 15 of 14 patients with alcoholic cirrhosis of the liver without jaundice were found to have subnormal powers of dark adaptation. The condition responded to the administration of adequate amounts of the vitamin. This confirms the opinion that disturbances of liver function may be reflected in alterations of the economy of Vitamin A. A reliable method for quantitatively measuring various degrees of Vitamin A deficiency should be of considerable importance in diagnosis and in the determination of the Vitamin A requirements of man.

INTESTINAL ABSORPTION

It has been known for a number of years that various simple sugars are absorbed from the intestines at different rates. Glucose and galactose are absorbed much more rapidly than other monose sugars such as xylose. The rate of absorption of xylose increases with its concentration in the intestine which suggests that a process of diffusion is involved. Glucose and galactose on the other hand are absorbed at a constant rate regardless of their concentrations in the intestine. This implies that a chemical process is involved rather than a physical one. This so-called selective absorption is more prominent in the upper portion of the small intestine than in the lower portion according to Verzar and Wirz (18). Like other chemical processes it is very easily affected by changes of temperature. The chemical reaction is believed to consist of phosphorylation since it is inhibited by phlorizin and iodoacetic acid, two compounds which have been shown to inhibit phosphorylation processes in the body. The selective absorption of fat is also believed to be dependent upon phosphorylation since it is also inhibited by phlorizin and iodoacetic acid.

Verzar and Laszt (19) claim that adrenalectomy in rats interferes with the process of selective absorption of fats. Laszt and Verzar (20) and Judovits and Verzar (21) have reported that selective absorption of glucose is prevented by adre-

nalectomy. Laszt (22) has recently reported that adrenalectomy interferes with selective absorption of the amino-acid glycine. The only attempt at confirmation of this work that has appeared is that of Deuel, Hallman, Murray and Samuels (23) who employed adrenalectomized rats maintained in excellent condition by the careful administration of the proper salt solutions and who failed to observe any disturbance of glucose absorption. One is forced to conclude that in well developed adrenal insufficiency as found in Verzar's experiments selective absorption may be impaired but that the hormone of the adrenal cortex is not indispensable for the process. Recently Fitzgerald, Laszt and Verzar (24) have reported that hypophysectomy interferes with selective absorption presumably because of the atrophy of the adrenal cortex. This may not be the only factor involved however for Althausen and Stockholm (25) have shown that the thyroid also plays a rôle in intestinal absorption. They found that thyroidectomy reduces and the administration of thyroid substance increases the selective absorption of glucose. It is clear that alterations in intestinal absorption may be expected in various endocrine dyscrasias. There may also be a relationship between the altered alimentary glucose tolerance curves and the rate of intestinal absorption in diseases such as hypothyroidism, hyper-

thyroidism, Addison's disease, Cushing's syndrome, and chromophobe adenomas of the pituitary gland

It has been shown that patients with sprue, non-tropical sprue, and celiac disease exhibit a minimal rise in blood sugar following the ingestion of glucose (Thaysen [26], Hanes and McBryde [27]). Barker and Rhoads (28) have recently reported that patients with sprue do not show the normal rise in blood fats following the ingestion of a fatty meal. These findings support the view that intestinal absorption is impaired in these diseases. Following the parenteral administration of liver extract which is potent in the treatment of pernicious anemia, the steatorrhea, anemia, and the fat and glucose tolerance curves are restored

to normal. Castle, Rhoads, Lawson, and Payne (29) believe that the active constituent of the liver extract is the anti-pernicious anemia principle. Verzar (30), on the other hand, maintains that sprue results from an adrenal cortical insufficiency and that liver extract is potent by virtue of its content of flavin-phosphoric acid, which he claims the body is unable to synthesize in the absence of the adrenals. It is not impossible that both interpretations are incorrect. Nevertheless, these findings suggest the possible importance of nutritional factors in the regulation of intestinal absorption. Certainly it would be desirable to attempt to isolate and identify the constituent of liver extract which is so effective in the treatment of idiopathic steatorrhea.

PNEUMONIA

Most individuals harbor virulent pneumococci in their respiratory passages without, however, having pneumonia. It is generally stated, therefore, that an individual succumbs to pneumonia only when his "resistance is lowered." Although this provides a name for the condition, it provides no information concerning the nature of "resistance" or the factors which lower it. Recently attempts have been made to determine the nature of the "resistance" and the factors which influence it in experimental animals. According to Gunn (31), who has recently described in detail the pathogenesis of pneumonia in man and in animals, the form of experimental pneumonia which has been produced in rats and dogs most closely resembles the clinical form of the disease. In 1933 Terell, Robertson, and Coggeshall (32) produced typical lobar pneumonia in dogs by introducing into the terminal bronchi a suspension of pneumococci in a viscous solution of starch. During this procedure the larynx was cocaineized and morphine was administered in doses which produced a lowering of the body temperature. According to Coggeshall and Robertson (33) dogs show a somewhat increased resistance to the disease when pneumococci are again introduced into the bronchi several weeks or months after recovery from a previous attack. The repeated attacks were of less severity, particularly when the same lobe was reinfected. This acquired partial immunity was not due to an increase in the circulating antibodies. The characteristic difference was the earlier appearance of the local macrophage reaction. This consists of the change of cellular elements from polymorphonuclear to macrophage cells in the affected lung area. Robertson (34) found also that

active or passive immunization of the animals merely limited the extent of the lesion and the duration of the attack, without affecting the incidence of pneumonia. These findings revealed the importance of local defense mechanisms in the process of recovery from an attack of pneumonia. Recently Robertson and Loosh (35) have reported that recovery never occurs without the macrophage reaction. In a given area of affected lung, the number of pneumococci was found to vary inversely with the number of macrophages, which suggested that the latter was responsible for the sterilization of the tissues. Some animals died in spite of a vigorous macrophage reaction, but these animals were frequently found to exhibit a bacteremia. Accordingly, both general and local mechanisms are concerned with combating pneumonia, although the latter is probably of greater importance as revealed by instances in which a resolving lesion and a metastatic developing lesion were present simultaneously (Robertson and Coggeshall [36]).

The above work was concerned mainly with the process of recovery from pneumonia, although the fact that the disease was produced by suspending the organisms in a starch medium for introduction into the bronchi, and the fact that morphine and cocaine anesthesia were used, suggest interesting possibilities regarding the conditions necessary for the induction of the disease. Several years ago Nungester and Jourdonais (37) reported that a typical lobar pneumonia could be produced in rats by the introduction of pneumococci suspended in a viscous solution of mucin into the bronchi. Nungester and Klepser (38) have investigated the factors which influence the resistance of

the host to an attack of pneumonia. Spraying the pneumococci intranasally never produced pneumonia unless sterile mucin had been introduced into the bronchi on the previous day. This clearly demonstrated that the presence of mucous secretion in the lower respiratory passages markedly decreased the resistance of the host to pneumonia. It was then found that prolonged ether anesthesia exposure to cold and intoxication with alcohol increased the amount of mucin which was aspirated into the lungs from the nose. Furthermore these procedures increased the incidence of pneumonia which followed the introduction of bacteria and mucin into the nasal passages. An important factor which was responsible for the increased aspiration was found to be that of interference with reflex swallowing and closure of the glottis.

Locke (39) has measured the 'fitness' of rabbits by determining the time required for restoration of a normal body temperature after exposure to cold. He found a correlation between this fitness index and the rate at which intravenously injected pneumococci were removed from the blood stream. This index was lowered by maintenance of the animals in overheated quarters by morphine and by starvation the index was raised by the administration of pituitary, adrenal and liver extracts. In man a fitness index was determined by the rate of oxygen consumption during strenuous exercise on a bicycle ergograph. A correlation between this index and the incidence of upper respiratory infections was observed.

Pickrell (40) (41) has studied the effect of alcohol intoxication and ether or avertin anesthesia on the resistance of rabbits to intradermally and intratracheally administered pneumococci. Even in animals rendered highly immune by specific anti-pneumococcus serum alcohol intoxication and

ether or avertin anesthesia completely destroyed the resistance to pneumococcal infection for as long as the intoxication was maintained. This was found to be due to an inhibition of the vascular inflammatory response because of the absence of capillary dilatation and margination of the leucocytes in the capillaries. Leucocytic migration was almost completely prevented and the injected bacteria were able to proliferate without interference. It would appear therefore that anesthesia and alcohol intoxication lower resistance to pneumonia not only by permitting access of infecting material into the lower respiratory passages but also by rendering the tissues incapable of defending themselves against invading organisms. This work certainly explains the high incidence and severity of pneumonia in alcoholism; it also explains the well known danger of prolonged surgical anesthesia.

In recent years it has been recognized that lipoid pneumonia not infrequently follows intranasal medication with oily solutions. Walsh and Cannon (42) have shown that oils introduced into the nose of rabbits descend into the lungs where they produce edema, desquamative alveolitis and focal lipoid pneumonia. When bacteria were suspended in the oily granulomatous lesions in the lungs resulted. Aqueous solutions of various antiseptics and stringents when placed in the nose were found to produce edema, severe focal necrosis, purulent bronchitis and occasionally bronchopneumonia. The more severe lesions were obtained in experiments in which bacteria were suspended in the solutions or in which the animal already had an upper respiratory infection. Therapeutically of course such solutions are used when the patient has an inflammation in the nose. Solutions of vasoconstrictor drugs in normal saline which are probably most effective therapeutically had no deleterious action on the lungs.

PREGNANCY AND LABOR

In a previous review of this series (43) the subject of pregnancy and labor was considered. It was mentioned without further discussion that the factors initiating labor are resident in the uterus or in its contents including the placenta. It is our purpose now to consider this subject in greater detail.

Selye, Collip and Thompson (44) reported that after removal of the embryos alone from rats at midpregnancy the placentas were retained until term at which time they were delivered. Newton (45) observed the same phenomenon to occur in pregnant mice when the embryos were destroyed

without removal. He also noted that under these conditions the estrus cycle was suppressed as in a normal pregnancy until after delivery. Klein (46) observed that removal of the gravid uterus in rats restored the estrus cycle immediately whereas removal of the embryos alone permitted maintenance of the vaginal epithelium in the typical pregnant state until term. Recently Kirsch (47) has made a careful and detailed study of this phenomenon. He removed the fetuses of pregnant rats at various stages of gestation and found that the placentas were always retained until term. If all the fetuses and their placentas were removed and

replaced by pellets of the same size and shape, the latter were always aborted. On the other hand, if all the fetuses and one-half of the placentas were removed, the pellets were retained until term. *This evidence conclusively showed that the fetus is not necessary for initiating labor, and that the uteroplacental complex is indispensable for the process.*

As to the mechanism by which the uteroplacental complex controls the onset of labor, a mechanical effect was ruled out on the basis of the evidence that pellets alone were unable to substitute for the placenta in controlling the onset of labor. Extrinsic nerves have long been known to be of no significance in timing the onset of parturition. Kirsch showed that the intrinsic nerves of the uterus are not involved by means of experiments in which pellets were substituted for the contents of one uterine horn and the other uterine horn was completely isolated. In spite of the fact that no intrinsic nerve connections between the two horns remained, the pellets were delivered at term. Only a humoral mechanism remained to explain the manner in which the uteroplacental complex initiates labor. Furthermore, since abortion always follows removal of the placenta, *it would appear that cessation of an endocrine activity of the placenta is the factor which precipitates labor.*

As far as the evidence so far presented is concerned, it is not clear whether the uteroplacental complex is independently responsible for initiating parturition, or whether other endocrine glands, which influence the placenta, are primarily, but indirectly, responsible. The only other endocrine glands, which, in the present state of our knowledge, should be under suspicion are the adrenals, the ovaries, and the hypophysis. In regard to the adrenal glands, Allers, Nilson, and Kendall (48) have reported that an adrenalectomized female dog, maintained in good condition by careful regulation of the inorganic ion intake, was impregnated by an adrenalectomized male dog, and subsequently delivered a litter of normal pups. Apparently, therefore, the adrenal glands are not necessary for the initiation of labor. In regard to the ovaries, it has been shown that in certain species, notably the rat, mouse, and rabbit, the ovary is essential for the maintenance of pregnancy, whereas in certain other species, including the guinea pig, cat, and man, pregnancy is maintained, and delivery occurs at the proper time in the absence of the ovaries. It has generally been assumed that in those species in which the ovary is dispensable, the placenta takes over the endocrine function of the ovary. Haterius (49) noted that those animals in which the ovary is essential produce large litters of young, whereas the other

group of animals produce a limited number of offspring at each delivery. Accordingly, he excised the ovaries in rats after all but one fetus had been removed and found that under these circumstances the ovary was not essential, even in this species. Kirsch (47) confirmed these results. One may conclude that the ovaries do not initiate labor by the elaboration of an active principle at term, but that withdrawal of ovarian activity in certain species may be *partially* responsible for initiating labor, and in other species this gland plays no detectable rôle.

The situation with regard to the hypophysis is complicated by the difficulty of distinguishing between disturbances in the timing of labor and disturbances in the process of labor itself. As a result of the early work of Smith (50) it was believed that the posterior lobe of the pituitary is not involved in parturition. However, in this work the pituitary stalk and the median eminence, which are functional parts of the neural division of the hypophysis, were left intact. Fisher, Magoun, and Ranson (51) have recently shown that in cats with diabetes insipidus, in which the whole neural division of the hypophysis was inactivated by interruption of the supra-opticohypophyseal tracts, labor is distinctly abnormal. Labor is probably initiated at the proper time, but it is greatly prolonged and difficult. Labor may last for two days, it may be incomplete, ending fatally for the mother. This dystocia may be related to the complete absence of pitocin in the hypophysis of such animals. Such a prolonged labor may make it appear as though it were not initiated at the proper time. Hence the work on total hypophysectomy must be interpreted with caution when parturition is somewhat delayed.

Alan and Wiles (52) have reported normal delivery of mature fetuses in hypophysectomized cats. Pencharz and Lyons (53) found that hypophysectomy neither delayed nor prolonged labor in guinea pigs. It will be recalled that in these species the ovaries are not essential for the maintenance of pregnancy. In contrast to these results, Firor (54) has shown that hypophysectomy in rabbits is followed by abortion, accompanied by regression of the corpora lutea, which in this species are necessary for the maintenance of pregnancy. According to Pencharz and Long (55) and Selye, Collip, and Thompson (56) hypophysectomy in the last half of pregnancy in the rat does not produce abortion, but gestation may be somewhat prolonged. In this species, which requires the ovary, hypophysectomy does not result in regression of the corpora lutea. The situation in the mouse is somewhat paradoxical, for although abortion

follows gonadectomy abortion does not follow hypophysectomy in spite of the fact that regression of the corpora lutea occurs (Selye Collip and Thompson [37]) It may be concluded that the hypophysis does not initiate labor by liberating an active principle at the time of delivery because if pregnancy can be maintained parturition is not prevented by removal of the gland On the other hand cessation of activity on the part of the pituitary may be *partially* responsible for the initiation of labor in certain species and not required at all in other species It would appear that what influence the hypophysis does have is exerted on the corpora lutea *Probably in all species cessation of some activity on the part of the placenta precipitates labor to this function of the placenta the ovaries and pituitary gland play an auxiliary role in certain species* (The question of the completeness of the hypophysectomy is always involved in such experiments In our discussion we have assumed that the hypophysectomy was complete or almost so from a functional viewpoint Our assumption may or may not be correct In a review of this sort one has to place some credence in the opinion and statements of the authors in order to avoid prejudicing the matter)

If the above statement is true a rather interesting conclusion follows In a previous review of this series (43) it was mentioned that during the increasing urinary excretion of estrogens in human pregnancy there is a discernible twenty eight day fluctuation in the quantity eliminated There is other evidence supporting the view that the sexual cycle persists in reduced form throughout pregnancy In addition there is evidence that the average gestation period in various species is a simple multiple of the duration of the average sexual cycle (Snyder 58) It has been suggested that this rhythm is responsible for timing the appearance of parturition It would appear however that either this persistent rhythm bears no causal relationship to the onset of labor or else the rhythm is of uteroplacental origin

In the previous review on this subject it was pointed out that the excretion of estrogens reaches a peak at the time of parturition and that the previously mounting excretion of progesterone compounds suddenly ceases at this time and that these changes may be of great importance in precipitating labor If we follow the line of reasoning employed in the present discussion we must conclude that the placenta is responsible for the elaboration of these hormones Are we justified in attributing this function to the placenta? It has frequently been assumed that the placenta is the main source of sex hormones in pregnancy par-

ticularly in those species in which other endocrine glands are dispensable at this period There is however surprisingly little *direct* evidence supporting this interpretation Newton (59) has recently reviewed this subject in detail The evidence that the placenta elaborates the anterior pituitary like substance or prolactin obtainable from human pregnancy urine is quite adequate particularly since it has recently been reported by Gey Seegar and Hellman (60) to be secreted *in vitro* by tissue cultures of human placenta and hydatidiform mole The evidence in regard to estrogens is not so conclusive The fact that a hormone may be isolated from an organ is of itself no proof that it is formed by that organ In fact Parker and Tenney (61) have shown that the fetal liver contains more estrogens than the placenta The possibility that estrogens may be formed by fetal glands by the maternal ovaries and adrenals makes it difficult to determine how important the placenta is for their formation There is still less direct evidence in regard to the origin of progesterone in pregnancy However it appears very unlikely to the authors that the relatively enormous quantities of progesterone excreted in the last month of human pregnancy could originate in a regressing corpus luteum *Although conclusive proof may be lacking the available evidence is compatible with the view that the placenta is the main source of the sex hormones in pregnancy*

Brooksby and Newton (62) observed marked changes in the water balance in their experiments in which embryos were removed from mice the placentas being left intact to be delivered at term The weight loss of the animals at delivery was much greater than could be accounted for on the basis of the weight of the delivered uterine contents It was found that this extra weight loss was due to elimination of water which had been retained partly in the uterine musculature and partly in the body tissues in general This water retention was considered to be under the hormonal control of the placenta Strauss (63) has reported that a large proportion of women retain water up to 10 per cent of the body weight in the last trimester of pregnancy either with or without manifest edema When such patients are placed on a skimmed milk diet which is low in sodium and high in potassium and calcium the retained water is eliminated as indicated by loss of weight The degree of water loss in different subjects showed a high correlation with the colloid or protein osmotic pressure of the blood The lower the plasma protein concentration is the greater the water loss and presumably therefore the greater the previous water retention Strauss believes that the colloid osmotic

pressure of the blood is the primary factor responsible for water retention in pregnancy. This is probably the mechanism of the so-called "physiological" or "dilution" anemia of pregnancy.

Strauss's finding that the retained water is eliminated after alteration of the intake of inorganic ion of the patients implies at least the secondary importance of inorganic-ion balance. In normal individuals compensation for changes in the intake of inorganic ions is readily made by changes in the output of inorganic ions, so that marked changes in water balance do not occur. In an individual with a low colloid osmotic pressure of the blood, however, increased sodium intake results in the deposition of fluid in the tissues, a decrease in sodium intake results in a loss of fluid from the tissues for the reason that sodium is an essential component of edema fluid. In this sense, colloid osmotic pressure of the blood is a primary factor, and the inorganic-ion balance is a secondary one. The fact that the retained water is so rapidly eliminated after termination of pregnancy suggests that changes in colloid osmotic pressure are not the main factors operating at this time. It is equally difficult to believe that changes in the intake of inorganic ions are operative. We are left then with changes in the output of inorganic ions as being the principle factor involved in the sudden loss of retained water at parturition. Recent investigations have provided an explanation for such changes in the output of inorganic ions. Thorn, Nelson, and Thorn (64) have reported that women exhibit water retention intermenstrually and premenstrually. These are the periods when estrone excretion is greatest. The onset of menstruation is accompanied by increased water elimination. In dogs it was found that the administration of estrone, progesterone, pregnandiol, and testosterone induced retention of water, sodium, and chloride. Thorn and Engel (65) have also shown that these hormones increase the excretion of potassium. Kenyon (66) and Kenyon, Sandiford, Bryan, Knowlton, and Koch (67) have observed the same effects to follow the administration of testosterone in clinical eunuchoidism. Apparently, therefore, the sex hormones are able to regulate to some extent the excretion of certain inorganic ions in the urine. In this respect the sex hormones resemble the hormone or hormones of the adrenal cortex (Thorn, Engel, and Eisenberg [68]). The increased concentration of sex hormones in the body in pregnancy may well be responsible for the retention of sodium and water, the degree of retention is undoubtedly influenced by the plasma protein level. In controlling the edema of pregnancy, it

is obvious that the formation of the sex hormones cannot be regulated. *However, the intake of the important inorganic ions may be regulated, and the plasma protein level may be maintained by providing a diet adequate in protein.* By controlling these two factors, one should be able to counteract the effect of excessive sex hormone production.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Proell, F. W : The Regenerative Powers of the Jaw Bone in Osteomyelitis (Die regenerativen Kräfte der Kieferknochen bei osteomyelitischen Erkrankungen) *Deutsch Zahn u. Heilk*, 1938, 5 12

There are still considerable gaps in our knowledge of the biological changes and the action of regenerative powers in the healing of an osteomyelitis. The newer researches on the healing of fractures may also throw some light on bone regeneration in osteomyelitis. The changes in the development of pseudarthroses are similar to those changes noted in healing osteomyelitis of the jaws. The clinical course of osteomyelitis of the jaws is well known, also the rule of Axhausen, that every extraction in an early stage of inflammation of the jaws is to be avoided, with very few exceptions. The author, however, concedes the following to the dental practitioner when the roentgenogram of teeth or remnants of teeth with infected root canals indicates a central suppuration of the pulp, they are definitely to be extracted.

In acute osteomyelitis of an alveolar process the bone rapidly regenerates after the sequestrum is passed. In an acute suppurative inflammation of the marrow in the lower jaw the new bone formation depends on the condition of the bone and periosteum, the type and extent of the infection, and finally, the properly timed, but conservative opening of the abscess. Special types are to be considered: the primary chronic, the dry, non-suppurative (Parsch and Axhausen), and the chronic suppurative osteomyelitis. The exact relation of these to one another is not as yet clear. In the infant the condition previously known as "orbital phlegmon" or "sequestering dental germ inflammation" is considered to be a primary osteomyelitis of the jaws. Of considerable significance in these cases is the "incomplete development of the defense properties of the reticulo-endothelium." In operations on such infants "frequently too much healthy bone is removed as well as the healthy 'anlage' of the remaining teeth." If the line of the epiphysis is also disturbed, the well known bird face develops.

Bacteriologically the staphylococcus pyogenes aureus and albus are the most important organisms. Of histological significance is the early formation of osteophytes. Besides the periosteal new bone formation there is also a para-osteal bone development. There are special references to the work of Lauche of Nuernberg. Conservative management is advised in the treatment of chronic osteomyelitis, especially improvement of the general condition, vitamin-rich foods and the application of ozone mixtures (Fisch and Payr) are recommended and fully developed

abscesses apparent on roentgen examination should be opened. The removal of a sequestrum must "not be too soon in order not to interfere with the resulting ferments, and stimuli which cause bone destruction and bone formation."

(GERLACH) JACOB E. KLEIN, M.D.

EYE

Hubbard, W. B : Caustic Burns of the Eye. *Arch Ophth*, 1938, 19 968

This article contains information that is important to general practicing physicians, as well as to eye physicians, regarding the first aid and after-treatment of caustic burns of the eye.

For emergency treatment, water and weak acids should be used freely, alkaline neutralizing fluids should be avoided.

In the after-treatment of caustic burns of the eye, the use of alkalis should be avoided, especially in the early stages of treatment. Weak acids are of value. Treatment with tannic acid is usually preferred, and antiseptics, such as methyl rosaniline and silver nitrate, should be used in conjunction with it. To those not desiring to use tannic acid, a combination of methyl rosaniline and silver nitrate is recommended. Agents such as atropine and compresses should be used according to the indications.

LESLIE L. MCCOY, M.D.

Brunton, C. E. : Smooth Muscle of the Periorbita and the Mechanism of Exophthalmos. *Brit J Ophth*, 1938, 22 257

The author's experimental and research work gives some evidence that Mueller's muscle may be a mechanism for the production of exophthalmos in man.

1. The whole orbital region was removed in one piece from the heads of dogs and cats. After fixation, decalcification, and celloidin embedding, sections were stained by different methods.

2. Sections at various planes show how smooth muscle and elastic tissue join with collagenous fibers to form the periorbital membrane known as Mueller's orbital membrane or muscle. This is a funnel-shaped structure, having its apex around the optic foramen and attached in front to the orbital margin. In planes behind the eyeball it contains much smooth muscle. Its contraction increases pressure behind the globe and forces the globe forward. Its relations to the investing fascia of the extrinsic muscles of the eye and to the secreting glands of the orbital region are considered.

3. Mueller's orbital muscle in the lower animals is the final mechanism in them for proptosis.

otitis media and in mastoiditis, in which chronic disease is more prone to extend intracranially. Even to a greater extent than with otitis media, such rhinogenic complications are apparently much more common in males than in females—the ratio being 4 to 1.

NOAH D. FABRICANT, M.D.

Fig. F A Plastic Repair After Removal of Extensive Malignant Tumors of the Antrum *Arch Otolaryngol*, 1938, 28, 29

Facial deformity usually does not occur after removal of a malignant tumor of the antrum unless the growth has extended beyond the sinus. The most common disfigurements are elevation and retraction of the upper lip and angle of the mouth, perforation of the cheek and nose, and loss of the malar prominence, the inferior orbital border, and the eye.

Satisfactory plastic correction of the deformities is possible in most cases. To correct the elevation of the lip, the scarred attachment of the lip and cheek to the superior maxilla is freed, and a skin graft is applied to the denuded inner surface of these structures. Perforation of the cheek is repaired by a pedicle flap from the forehead or thorax. Loss of the inferior orbital border requires either a bone or a cartilage graft. Displacement of the meatus of the parotid duct rarely is sufficiently marked to produce symptoms. In one case the meatus was drawn up into the antrum in the process of healing, with resultant drainage of saliva from the nostril. This annoying condition was corrected by transplantation of the duct to approximately its normal position.

MOUTH

Bergendal, A. A Review of Twenty Years' Treatment of Lip Cancer with Radium at the Radiological Clinic, Lund, Sweden *Acta radiol*, 1938, 19, 103

The author discusses the results obtained in 265 cases of cancer of the lip treated at the Radiological Clinic, Lund, Sweden. In 90 of these, histological examinations of removed tissue were found to be positive, the remainder showed clinical signs of cancer. Ninety-one and three-tenths per cent of the patients were males, 67 per cent of whom were over sixty years of age. In 112 cases the disease had a known duration of one-half year to two years, in 32 cases there was a known duration of over two years. The author follows the Forssell classification of superficial and infiltrating types of the disease, and suggests three subdivisions:

- 1 The common superficial ulcer which comprises 73 per cent of the cases
- 2 The papillomatous tumor, which comprises 21 per cent of the cases
- 3 The submucous infiltrating type which comprises 6 per cent of the cases

The incidence of lymphatic-gland metastases is far greater in the infiltrating type than in the superficial type of the disease.

The author has considered first the treatment of the primary tumor. He discusses the evolution of the various prosthetic methods, the teleradium method, and, finally, the intratumoral intubation treatment with needles. This last method has been in use since 1931. The needles are placed 7 mm apart and a 10 mgm needle remains implanted for a period of from three to four hours. Previously, smaller quantities of radium were contained in each needle and the duration of treatment was consequently longer. Only rarely has it been necessary to incise any tissue because of a recurrence, and most recurrences are treated by further intubation. Eighty-five of the patients were treated with intubation, 7 with teleradium, and the remainder with radium prosthesis. Among the cases of 202 patients, complete freedom from symptoms was noted for three years in 78.7 per cent, and for five years in 63.9 per cent. When the cases are subdivided into operable (181) and inoperable (21) groups, freedom from symptoms for three years in the former group was found in 86.3 per cent, and for five years in 72 per cent. In the latter group, 28.6 per cent of the patients survived for three years and 25 per cent survived for five years. Those who died of intercurrent disease are not included in the above statistics, but the author points out that when these patients are included, the survival percentages are increased from 10 to 15 per cent.

In the treatment of the lymphatic glandular metastases, the author classifies the nodes into three groups:

- 1 Nodes which are not palpable, or which are soft and freely movable (159 cases)
- 2 Palpable, firm, hard nodes suspected of being cancerous, or definitely known to be cancerous (60 cases)
- 3 Fixed metastases in the glands (6 cases)

Before 1931 patients in the first group were given prophylactic x-ray irradiation of the neck only rarely, but since then it has been routine. Before 1929, patients in the second group were given radium prosthesis of from 3 to 6 mgmh at a distance of 3 cm, over a period of days. Since 1929, teleradiation, at a distance of 5 cm, totaling from 10,000 to 17,000 mgmh per field has been given. The remaining nodes are then removed surgically, with the simultaneous application of radium (from 1,200 to 1,500 mgmh) to the surgical wound, and, finally, post-operative treatment of the neck with teleradium or roentgen rays is given. For the third group, prosthetic irradiation, as described, was used prior to 1929, but since that time teleradium has been used in doses of from 10,000 to 18,000 mgmh in each field.

After three years, 84.3 per cent of the patients in the first group were free from symptoms, 73.2 per cent in the second group were free from symptoms and 10 were dying of cancer, all died in the third group. For the five-year period, the percentages were 68.9 and 59.1 respectively. Of the 120 patients in Group 1, in whom only the primary lesion was

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Fig1, F. A. Plastic Repair After Removal of Extensive Malignant Tumors of the Antrum. *Arch. Otolaryngol.*, 1938, 28, 29

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treated only 2 died as the result of the cancer of the lip. Of the remaining 39 patients 1 died of the disease and only 2 developed metastatic nodes. These were treated with teluradium and extirpation. The author concludes that expectant treatment of the metastatic areas is justified when the primary tumor is small and superficial but only when there are opportunities for frequent careful re-examination of the patient.

In this series there were 39 cases of operative recurrence with 20 surviving patients after three years and 14 after five years. They were treated with radium prosthesis of the lip and roentgen rays radium prosthesis and more recently with teluradium.

In conclusion the author compares his figures with those of a number of different leading surgical and radiological clinics. The results compare favorably with those obtained elsewhere.

BRADFORD CANNON, M.D.

PHARYNX

Fabreant M. B. The Clinical Features and the Pathogenesis of Ludwig's Angina (*Claque et pathogenèse de l'angine de Ludwig*). *Rev. de chir.* 1938 57 251.

Fabreant from a review of the clinical characteristics and the pathogenesis of Ludwig's angina concludes that the condition is due to anaerobic bacteria which invade the deeper portions of the oral cavity and penetrate the parapharyngeal space. Clinically Ludwig's angina is characterized especially in the early stages by slight changes in the skin which are not strictly limited; the infiltration is firm, the mucosa of the oral cavity is infiltrated and the sublingual region is involved so that the tongue is pushed upward and backward. There are fever and other signs of generalized toxemia. Submaxillary sublingual and retromaxillary phlegmons or adenitis involving the gland of this region may be confused with Ludwig's angina but these lesions promptly result in the formation of a localized abscess which is not the case in Ludwig's angina.

At operation in cases of Ludwig's angina a grayish infiltration of the tissues is found together with a moderate quantity of fluid resulting from putrid decomposition with a strong gangrenous odor. In the other lesions that may be confused with Ludwig's angina only pus is obtained; there is never any sign of putrid decomposition.

Only early diagnosis and prompt operation can save the life of the patient with Ludwig's angina. A transverse incision should be employed in the infiltrated area and the involved tissues widely exposed. If necessary the incision may extend around the entire circumference of the mandible; thus injury to the facial artery and veins is avoided. The infiltrated muscles should be cut transversely and the sublingual space widely opened up. The wound should be irrigated and frequently dressed with hydrogen peroxide. The value of hydrogen peroxide in

these cases does not lie in any bactericidal power it may have but is due to its liberation of oxygen which is unfavorable to the growth of anaerobic organisms. The author reports 4 cases of Ludwig's angina all of which were cured. ALICE M. MEYERS.

NECK

Ray B. S. Lingual Thyroid. *Arch. Surg.* 1938 37 316.

The author reports the case of a woman thirty-nine years of age who was found to have a tumor at the base of the tongue. This tumor had probably been present for several years but was known to be of less than ten years' duration. The basal metabolism of the patient was -3 per cent. Roentgen therapy (3,360 roentgens) was followed by a decrease in the size of the tumor. Three gold radon seeds were implanted and this was followed by necrosis, sloughing and sinus formation with constant discharge. A preliminary exploration of the neck showed no thyroid tissue. A tracheotomy was performed and the tumor removed. Following operation a hemorrhage occurred which required ligation of the left lingual artery. The pathological report indicated a long-standing fetal adenoma of the thyroid.

Examination of the patient one year following operation showed the basal metabolism to be -15. A small firm nodule 6 mm. in diameter at the base of the tongue may have represented a thyroid remnant.

The literature is reviewed. PAUL STARR, M.D.

Albright F., Sulkowitch H. W. and Bloomberg E. Hyperparathyroidism Due to Idiopathic Hypertrophy (Hyperplasia?) of Parathyroid Tissue. *Follow Up Report of 6 Cases*. *Arch. Int. Med.* 1938 62 199.

This contribution is a follow-up study of 6 cases of hyperparathyroidism with what has been termed primary hyperplasia of the parathyroid gland. All of the glands were more or less involved so that resection of one was not effective; all had to be exposed and completely or partially resected as indicated.

It is pointed out that the pathological condition of the parathyroid glands was histologically dissimilar from that in cases of undoubted hyperplasia of parathyroid tissue; that it has not yet been shown that the enormous enlargement of the glands in this condition (about 30 to 100 times) cannot be explained by hypertrophy of the cell and that the condition may be disorder of hormone production rather than hyperplasia.

The authors' studies showed that all of the glands from all 6 patients on all occasions revealed a similar histological picture. An enlargement of individual cells gave a histological picture different from that of compensatory hyperplasia in rickets and distinct from that of adenoma. It is suggested that the tissue change is an all or none one.

A distinct correlation was observed between the weight of the parathyroid tissue and the degree of

hyperparathyroidism, which finding was in marked contrast to the situation in cases of parathyroid adenoma

Evidence is presented to show that the underlying cause of the changes in the parathyroid glands was a chronic one, and in the case of 1 patient the condition had existed for at least ten years. There was little, if any, evidence of regeneration in the parathyroid tissue which was left in place after partial resection. The condition, therefore, is apparently amenable to permanent surgical cure. The optimum amount of tissue to be left in place at operation has not yet been determined, but any amount less than 400 mgm is probably not too much.

Preceding this experience, the authors had 1 patient who required 3 parathyroidectomies for control of the disease.

No evidence has been obtained to confirm the hypothesis that the condition is secondary to overactivity of some pituitary hormone.

PAUL STARR, M D

MacBryde, C M · The Treatment of Parathyroid Tetany with Dihydratichysterol. *J Am M Ass*, 1938, 111 304

Although modern surgery in large clinics has reduced the incidence of parathyroid tetany following operation on the thyroid gland, the number of cases has become larger because of the increasing frequency of these operations. The symptoms in many cases are temporary, however, chronic tetany develops in a number of patients because of removal of, or permanent injury to, the parathyroid glands or to their blood supply. A review of the measures used to alleviate chronic tetany reveals their inadequacy.

The intravenous use of calcium salts and the subcutaneous or intramuscular administration of parathyroid extract will relieve acute manifestations and temporarily restore the blood calcium to normal. These measures, however, are not suited to prolonged use because of the transitory rise of the blood calcium and the necessity of repeating the injections daily, at least. A tolerance to parathyroid extract is frequently developed, so that increasingly large doses are necessary, and finally little or no effect is obtained.

During the past year the author and his associates have employed a new therapeutic agent, a derivative of irradiated ergosterol known as dihydratichysterol. This substance has been employed in an oily solvent—5 mgm per cubic centimeter. With small doses of this drug given orally, they have been able for the first time to keep patients with tetany free from symptoms, and to keep the blood calcium at normal levels.

The author reports 7 cases in which chronic hypocalcemia and the symptoms of tetany were treated with dihydratichysterol. In 6 patients the tetany occurred following thyroid operations, in the youngest patient, who was twenty-one years of age, it was of the so-called idiopathic type.

Dihydratichysterol has certain very definite advantages over parathyroid extract in the treatment of chronic tetany.

- 1 The effect is more prolonged
- 2 It is taken orally
- 3 No tolerance is developed
- 4 It is less expensive
- 5 It is stable and retains its potency when kept at ordinary room temperature

The author warns against the indiscriminate use of this very potent preparation. Excessive doses of dihydratichysterol cause hypercalcemia and severe toxic effects. There is great individual variation in the response to the drug. Only small amounts are necessary, and until maintenance dosage is established frequent determinations of the blood calcium must be made. Large doses that have been given to experimental animals have caused decalcification of the bones and metastatic calcification.

The mechanism of the action of this sterol has not yet been sufficiently studied. Calcium and phosphorus-balance experiments are being conducted to determine whether or not an increased storage occurs and whether the increase in blood calcium has as its source the gastro-intestinal tract or the bones.

JOHN H GARLOCK, M D

Tilley, H · Some Clinical Aspects of Vocal-Cord Inaction. *J Laryngol & Otol*, 1938, 53 355

In altering the perspective of views held by him a decade ago, Tilley attempts to find some explanation of those not infrequent cases in which hoarseness, or some less definite alteration of the voice, has been found to be due to an inactive but otherwise normal vocal cord, a condition which could not be traced to a comparatively gross lesion involving the origin, course, or distribution of the corresponding recurrent laryngeal nerve. He reports 18 cases of both permanent and temporary paralysis or inaction of the vocal cord. In 1 of these cases the patient had pulmonary tuberculosis, in another an aortic aneurysm, in 4 cases a local mechanical lesion produced stabilization of one cord or both cords. In the remaining 12 cases, the left cord was inactive as a sequel to a severe vocal strain (shouting), in the other cases the condition followed an acute infection and was evidently due to blood-borne bacterial toxins, or was associated with a metabolic disease (gout). In 11 of these 12 cases the left cord alone was involved, in but 1 instance was the right cord involved.

The author suggests that paralysis of the vocal cord may be due to a deficiency of Vitamin B₁. In those cases in which a local lesion involves the extracranial course of a recurrent laryngeal nerve, Tilley attributes the paralysis to anemia produced by pressure and followed by degenerative atrophic changes in that portion of the nerve in immediate contact with the primary lesion. However, in the case of circulatory poisons (bacterial or chemical), peripheral neuritis would seem to be the essential pathology of the paralysis. In several of the cases of this type

there was a comparatively sudden onset and an equally rapid disappearance of the paresis of the vocal cord. A similar phenomenon occurs frequently during the course of peripheral neuritis involving other regions of the body.

Why the left vocal cord is so much more frequently paralyzed than the right as a result of the apparent selectivity of blood borne toxins remains unexplained. The fact that the left recurrent laryngeal nerve has a longer intrathoracic course than the right would explain its greater vulnerability to local conditions producing pressure but whether this greater length implies increased sensitivity to other factors or whether the left side structures are congenitally less resistant than the right must await an answer.

NOAH D. FABRICANT, M.D.

Rosti E. Roentgen and Radium Therapy of Laryngeal Papillomas (La roentgen e la radioterapia nella cura dei papillomi laringei). *Radiol. med.* 1938 25 547.

Papillomas are the most frequently observed benign neoplasms of the larynx. They are most commonly found in children and sometimes in infants a few months old. They may be sessile or pedunculated, single or multiple. They are reddish or grayish, the color depending upon the thickness of the epithelial lining and they are extremely friable.

Their sites of predilection are the vocal cord but they may be found also on the false vocal cords in the ventricles on the epiglottis and more rarely on the posterior laryngeal wall. Papillomas of the larynx are benign tumors and consequently they do not give rise to metastases.

Clinically these tumors produce changes in the voice and disturbances in breathing according to their location.

Histologically papillomas of the larynx are made up of epithelium and connective tissue of the laryngeal mucosa and appear to be hyperplastic.

The etiology of the condition is controversial. Some believe that these tumors are due to hereditary tuberculosis or lues whereas others consider them as sequelae to certain infectious diseases. A third group of investigators attribute them to overusage

of the voice to the tobacco habit or to an ultrafilterable virus. None of these theories has been definitely proved, however.

Various methods of treatment have been devised such as topical applications of silver nitrate or ferric chloride or of chromic nitric lactic or salicylic acids. Systemic treatment includes the administration of iodides and arsenical. For a certain time tracheotomy and intubation were the methods of choice in cases of laryngeal stenosis produced secondarily by the papilloma. Some good results have also been obtained from diathermy and diathermocoagulation.

For the treatment of papilloma of the larynx radium therapy was introduced in 1911 by Polyach and roentgenotherapy in 1913 by Killian. The results obtained were reported to be excellent. By these methods the author treated 5 patients with papillomas of the larynx of whom 3 were children and 2 were adolescent girls fourteen and nineteen years of age respectively.

The radium was administered transcutaneously through a 2 mm. primary lead filter and a secondary gutta-percha and gauze filter arranged to produce a focal distance of 2 cm. The radium needles were placed about 1 cm. apart parallel on a lead disc and 3 applications were made amounting to 0.66 mc per sq cm, 0.82 mc per sq cm and 1.30 mc per sq cm respectively. These courses were repeated in ten and sixteen months. No untoward effects were observed but inasmuch as the results were uncertain the treatment was continued with roentgen rays.

The roentgen ray applications were divided in courses of 3 exposures each given about three or four days apart. A 5 mm. aluminum filter was used with a focal distance of 38 cm. The average dose was 150 roentgens per exposure (450 roentgens per course) but in severe case it was increased to 200 roentgens per exposure. The individual courses were repeated in two and three weeks and in monthly intervals up to six months.

In all cases Rosti observed a retrogression of the lesions and stated that no untoward reactions resulted from this type of treatment.

RICHARD E. SOMMA, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Léorat, L. The Treatment of Cerebellar Abscess (Traitement des abcès du cervelet) *Rev de chir*, Par, 1938, 57 444

When the cerebellar abscess is of otitic origin, the treatment is to be surgical in all cases, and should be done in two stages first, the tympanic cavity-mastoid débridement with drainage, and, later, the localization (by cannula puncture), drainage, and gradual evacuation of the abscess cavity Obviously, it is highly important to avoid meningitis due to contamination at the dural opening, and Léorat favors drainage, not through the opening made at the first operation, but rather through a clean area of scalp, bone, and dura mater

In a short review of the various means of attack in the treatment of such an abscess, the author describes four of the more commonly employed procedures

1 *The "classical" operation* A 2 by 3 cm crucial incision is made in the dura mater, preferably not in the dura under the mastoid, but further posteriorly through a fresh scalp and bone opening, the intracranial tension present in most cases will cause enough herniation to block off the subdural space at the incision If this does not occur, or if, before incision, there is no apparent hypertension, the area of incision may be lightly coagulated with the electric scalpel A blunt cannula or trocar of generous diameter is then passed slowly into the hemisphere and moved repeatedly in various planes if the initial puncture fails to find the pus When the cavity has been found, a drain of gauze or gutta percha, or a glass tube drain, is passed into it by means of a fine forceps, and drainage may then be maintained either by intermittent bilateral jugular compression, or by actual aspiration The author suggests the injection of lipiodol and x-ray study for determination of the limits of the cavity Lavage of the cavity is never done unless the organism is anaerobic Drainage may not be necessary if the collection of pus is small or superficial, and repeated cannula puncture may be done at intervals of a few days if drainage is believed unwise

2 *The technique of LeMaitre* Through the original mastoid opening, a fine needle is passed into the pus cavity without incision of the dura This needle is left in place from twenty-four to forty-eight hours, by the end of which period adhesions have formed between the cerebellar cortex and dura about the needle At the first postoperative dressing a slightly larger needle is passed into the cavity, the original needle having been withdrawn carefully without rupture of the surrounding adhesions Each succeeding day a larger hollow drain is inserted until the cavity is clean and collapsed, then drains of

gradually diminishing size are used until the fistula is so fine that it closes spontaneously

3 *The technique of Tobey* Through a large sub-occipital craniectomy the pus cavity is located by puncture with a fine needle Then, with the needle still in place, a bloc of tissue is removed by electrocautery, this procedure uncapping the abscess widely A drain of generous proportions is used

4 *Total extirpation of the encapsulated abscess* This is done through a craniectomy opening, by means of electrocautery This method is more theoretical than practical, because according to the author, an encapsulated cerebellar abscess of otitic origin is rarely encountered

The choice of operation is always a major problem and it must be decided by a consideration of the conditions peculiar to the case or by the operator's experience Postoperative complications are frequent and severe, meticulous postoperative management is imperative The number of cures does not exceed 25 per cent, and 42 per cent of the cerebellar abscesses are not found even at operation Most neurological surgeons realize that the gravity of cerebellar abscesses is contingent on the difficulty involved in their diagnosis and treatment

JOHN MARTIN, M D

Williams, D, and Gibbs, F A The Localization of Intracranial Lesions by Electro-Encephalography *New England J M*, 1938, 218 998

The authors present a very hopeful picture of new and accurate localization of cerebral lesions Their method has the advantage of causing no inconvenience to the patient

For the purpose of this study patients were sent to the authors for electro-encephalography without their clinical reports, and the results of the study were inserted in the record before the case histories were made available Eighty patients were examined, 50 had abnormal cortical potentials with evidence of focal disturbance, 17 showed no cortical abnormality, and 13 had records of epilepsy without any evidence of a constant focus of discharge of slow waves Of the 50 patients in whom a focus of abnormality was found, the position of the organic lesion was demonstrated in 37, in 6, electro-encephalography was the principle means of localization of the lesion, which was later exposed by operation, and in 7 a negative diagnosis was suggested, in spite of clinical evidence to the contrary, and was later found to be correct

The authors point out that the cortical defect is not in itself responsible for the abnormal frequencies It appears that the slow waves emanate particularly from the region of diffuse cortical lesions with prolonged cortical damage in the absence of complete cell destruction It is curious to note that in the case of a gunshot wound of the left occipital region,

there was a comparatively sudden onset and an equally rapid disappearance of the paresis of the vocal cord. A similar phenomenon occurs frequently during the course of peripheral neuritis involving other regions of the body.

Why the left vocal cord is so much more frequently paralyzed than the right as a result of the apparent selectivity of blood borne toxins remains unexplained. The fact that the left recurrent laryngeal nerve has a longer intrathoracic course than the right would explain its greater vulnerability to local conditions producing pressure but whether this greater length implies increased sensitivity to other factors or whether the left side structures are congenitally less resistant than the right must await an answer.

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RICHARD E. SOMMA, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Einaudi, M A Contribution to the Study of Mammary Bleeding (Contributo allo studio della mammella sanguinante) *Ginecologia*, Torino, 1938, 4 289

The type of mammary bleeding discussed in this article is due either to a functional anomaly of the organ, or to a general disease or functional disturbance of the entire constitution, more frequently it is based on a true anatomical lesion of the gland itself. Most authors prefer to limit the term "bleeding breasts" to conditions not associated with clinical or histological changes in the breast, nor with menstruation, but based rather on a psychic or neurotic constitutional disturbance associated with a functional change in the breasts. However, many such cases presumed to be functional have not been checked by a histological study of the breasts.

Hendriock has recently reported a case of true mammary bleeding in which histological examination revealed the presence of considerable quantities of blood which had escaped by diapedesis from capillaries about the acini, and showed no evidence of neoplasm. The bleeding usually occurs when a vessel ruptures and the blood finds its way through the galactiferous ducts.

Uffreduzzi considers the cause of the bleeding to be a papillomatous endocanalicular adenoma, sometimes designated as dendritic papilloma. In 15 per cent of the cases of fibrosis cystica there is a co-existent bloody-serous discharge.

According to Brancati bloody secretion from the nipple is a pathognomonic sign of dendritic neoplasm of the galactiferous ducts and of papillomatous adenocarcinoma. Bleeding may also occur in sarcoma of the breast and in angioma. Also special types of tumors may cause mammary bleeding, such as hemangioma, lymphangioma, hemangio-endothelioma, hemo-angiosarcoma, and endo-angiosarcoma.

In 1927 Hart of Baltimore examined 127 cases clinically and histologically, and concluded that in 66 per cent the hemorrhage was due to a vegetating intracanalicular tumor of benign nature.

Erdheim of Vienna in 1927 reported on 17 cases of bleeding breast. In 70 per cent of them papillomas or polyps were located in the large galactiferous ducts, they were of a benign nature. He considered bleeding from the breasts to be benign as a rule.

On the contrary, Klose of Danzig in 1926 found constantly in 9 cases studied histologically that there were cancerous changes even in the absence of a palpable tumor.

According to Schweritz cysto-epithelioma and cystic breast are the basic pathological changes in bleeding breast.

In the period from 1935 to 1938 the author had occasion to study 5 cases of bleeding breast in

women and 1 case in a man. The clinical histories are briefly reported and the histological findings described. The microscopic diagnoses in the women were as follows: cystadenoma, endocanalicular carcinoma, fibrocystic papilloma, papillomatous adenocarcinoma, and intracanalicular epithelioma. The twenty-year-old man had a fibrocystic condition of the right breast.

Various statistics are presented regarding the incidence and seriousness of the condition. Some authors have reported a correlation between menstruation and mammary bleeding. As to the pathogenesis of bleeding of the breast when there is no local pathology, the author cites the following conditions: hysteria, ovarian insufficiency (tuberculosis, ovarian tumor, and pluri-glandular disturbances), obstructions to the menstrual flow, arterial hypertension, and diseases of the blood and arteries.

Therapy varies with the findings, in doubtful cases a biopsy should be done.

JACOB E. KLEIN, M.D.

Marshall, S. F., and Higginbotham, J. Carcinoma of the Breast. An Analysis of 196 Cases. *Surg Clin North Am*, 1938, 18 615.

The authors have reviewed a series of 196 cases of carcinoma of the breast in which operation was performed at the Lahey Clinic in Boston from 1926 to 1936, inclusive.

There has been little improvement in the results obtained by radical operation since the introduction of the method of radical mastectomy, as reported by Halsted in 1894.

If operation can be performed when the malignant lesion is restricted to the breast, a five-year survival can be expected in approximately 65 to 70 per cent of the patients, whereas if the axillary nodes are involved at the time the patient is first examined, approximately 18 to 20 per cent can be expected to survive the five-year period.

In this study the average age for the entire group was fifty-five and six-tenths years.

The most common complaint was the discovery of a tumor in the breast. This occurred in 167 patients, or 84 per cent. Only 7 patients complained of pain associated with the mass. The value of a careful physical examination is well illustrated by the group of 8 patients who were completely unaware of the presence of a tumor of the breast until examination disclosed its presence.

In 202 instances, including bilateral malignancy, the pathological type and the presence or absence of lymph node involvement were recorded. Of the 196 patients in the group, 57 or 28.1 per cent had adenocarcinoma, whereas in a much larger group, 143 patients, or 70.9 per cent, had carcinoma simplex. Forty per cent of the patients with adenocarcinoma had metastasis to the axillary glands,

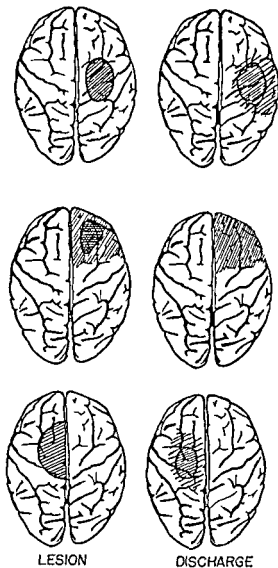


Fig. 1. Charts of the cerebral hemispheres of 3 patients in whom the lesion was seen at operation. On the left is shown the position of the lesion as drawn by the neurosurgeon after the operation. On the right is the position of the focus of abnormal activity as drawn on the report sheet given to the neurosurgeon before the operation.

operation was undertaken the following day. The track was excised down into the ventricle and the patient recovered. When discharged from the hos-

pital the patient had a complete right homonymous hemianopia without any abnormally low activity from the left occiput. ADRIEN VERBRUGGHE, M.D.

Jefferson G and Smalley A A. Progressive Facial Palsy Produced by Intratemporal Epidermoids. *J Laryngol & Otol* 1938 53 417.

That epidermoids in the temporal bone may cause progressive facial palsy is clearly illustrated by the 6 cases reported in this article. A neurosurgeon collaborated in the preparation of the article because the patients had sought his advice for the facial paralysis. In most cases an otitic cause for the condition had been negatived by the otologist.

Each case is very carefully recorded and considered. The facial paralysis was slow to develop in 4 cases it was complete and in 2 cases incomplete. The combination of facial palsy and deafness suggested the possibility of the presence of an acoustic neuroma, but after careful analysis this was ruled out by the absence of cerebellar and trigeminal symptoms and signs of increased intracranial pressure. In 3 cases there was no history of otorrhea at any time and in 1 it was doubtful. In 3 of these 4 cases the drum membranes showed no signs of having been perforated. All were healed and uninfected when the epidermoids were removed at operation. In 5 cases of the conductive type there was a varying degree of deafness in the affected ears. The cold caloric response was absent in 4 cases, minimal in 1 and normal in the other. In 5 cases the dura of the middle fossa was exposed by the tumor.

The tumors can be seen best by means of x-ray films taken in the Towne position. As it is often difficult to visualize them, special tangential films may be necessary.

The pathogenesis of cholesteatomata is discussed and the authors agree with Patterson that the term is a poor one, especially for cases in which prolonged sepsis has not occurred. The cases under discussion are regarded as being of embryonal origin; they are thus drawn into line with intradural epidermoids.

The treatment consisted in removal of the epidermoid, but unfortunately this did not always result in cure of the facial palsy. In 1 case the palsy completely disappeared, but in the others there was so much destruction of the facial nerve that even an autogenous graft was ineffectual. In 3 cases some anxiety was caused by cerebrospinal fluid leaks at operation, but these were controlled by muscle stamps.

In summary, 6 cases of slowly produced facial paralysis associated with deafness are described; the condition was due to latent non-infected petromastoid epidermoids; the tympanic membranes being intact in all cases.

ADRIEN VERBRUGGHE, M.D.

hape. In the dry specimen two or three honeycomb compartments are seen within the sacculle of the alveolus, produced by projections arising from its wall. The terminal portions of these septa are rounded into cup-like openings. The edge of the septum and the mouth of the alveolus are thickened and contain a vessel. The smallest possible capillaries give ridge-like appearances to the alveolar wall. The lumen of these vessels is large enough to permit only one red blood cell to pass through at a time.

The author studied the alveolar circulation in the lungs of anesthetized alligators and pithed frogs. The one-cell capillaries arise from the multiple-cell capillary located in the periphery of the alveolar wall. These one-cell capillaries follow a tortuous course to terminate in the opposite multiple-cell capillary. No reverse flow of blood was ever noted by the author, the flow always being in one direction. Full distention or full contraction of the lungs causes the blood flow to become retarded. It is accelerated coincident with the process of distention or contraction.

The author also noted bronchioles that end abruptly underneath the pleura without any alveolar subdivision.

The lung contains a thick yellow gelatinous substance that acts as an adhesive agent in case of minor injuries. Injury to the lung without injury to any larger bronchi or vessels causes this substance to fill in the space and promptly stop the air from leaking out of the injured part.

Observation of the lung through a thoracoscope and also through a fluorescent roentgen screen revealed a slight pulmonary expansion coincident with the cardiac systole. This increase in pulmonary volume disappears during the diastolic phase of the cardiac cycle.

EARL O. LATIMER, M.D.

Castex, M. R., Mazzei, E. S., and Vaccarezza, O. A.

The Anatomy, Radiology, and Pleuroscopy of Subpleural Bullæ, the Role of Effort in Their Formation and Rupture (*Anatomie, Radiologie et Pleuroscopie des bulles sous-pleurales. Role de l'effort dans leur formation et rupture*). *Arch. med.-chir. de l'appar. respir.*, 1937, 12: 345.

The study of spontaneous pneumothorax in general and benign spontaneous pneumothorax in particular has led to a better knowledge concerning subpleural bullous formations. These bullæ must be differentiated from emphysema. The subpleural bullæ are formed in pleuropulmonary tissue altered by previous scar formation, by malformations, or by circulatory disturbances. The most frequent cause is scar formation, which interferes with the normal elasticity of the pulmonary tissues. The subpleural bullæ are caused by the rupture of the subserous connective tissue at the site of a scar. They are small to moderate in size, usually multiple, and located immediately below the visceral pleura, the lung tissue is healthy or only slightly involved, and the condition occurs in younger people. To be contrasted

with this is emphysema in which the bullæ are caused by the rupture of alveolar septa and the formation of intrapulmonary sacs, which may be large or gigantic in size and are single or few in number. They occur in the pulmonary tissue itself in the cortical zone, and usually in the adult or aged person. The lung tissue is emphysematous.

Roentgenological study of subpleural bullæ is quite recent. The authors have checked the x-ray findings with pleuroscopic findings and have been able to establish the nature of the roentgenological image. Laurell has proved experimentally that subpleural bullæ show annular shadows on x-ray films. In lungs without pneumothorax these x-ray findings are frequently mistaken for parenchymatous cavities. It is easier to diagnose the bullæ in the presence of pneumothorax.

Effort is frequently a decisive factor in the causation of subpleural bullæ, especially any effort which raises the intra-alveolar tension. Thus respiratory efforts, such as coughing, crying, and laughter, and bodily exertions, such as sports, defecation, and accouchement, tend to increase intra-alveolar pressure and encourage the formation of subpleural bullæ in susceptible tissues.

This study is illustrated with several color plates and a series of roentgenograms.

JACOB E. KLEIN, M.D.

Walsh, T. W., and Meyer, O. O. **Coexistence of Bronchiectasis and Sinusitis**. *Arch. Int. Med.*, 1938, 61: 890.

The frequent coexistence of bronchitis and bronchiectasis with sinusitis is recognized by otolaryngologists, but whether the sinusitis follows, precedes, or develops simultaneously with the bronchitis is not as yet determined.

This paper is an analysis of bronchiectasis in 217 patients, of whom 145 had an associated sinusitis. Of these, the majority had no subjective symptoms of sinusitis, 58 per cent were males and 42 per cent were females. The oldest was seventy-two years of age and the youngest was six, the average age being thirty-two years. The bronchiectasis in 22 patients had been preceded by influenza and by pneumonia in 19.

As a class, the patients with sinusitis were younger than those without. No definite conclusion could be drawn from this series as to the relation between the degree of sinusitis and the degree of bronchiectasis.

Contrary to general opinion, in the cases of bilateral involvement of the lungs there was no apparent predominance of the disease in the right lung, and in cases of unilateral involvement the right lung was shown to have no greater incidence of the disease than the left.

The authors believe that the relation between sinusitis and bronchiectasis is more than coincidental and that drainage from the sinuses, especially when the patient is recumbent and asleep, favors repeated infection of the bronchi.

whereas 52.4 per cent of the patients with carcinoma simplex had involvement of the axillary glands.

Unless definite evidence of metastatic malignancy can be found elsewhere than as indicated by palpable axillary glands, radical mastectomy is performed upon most patients. If there is a fixed mass in the axilla adherent to the chest wall or an associated edema of the arm on the affected side, radical mastectomy is contraindicated in most cases. The method of treatment employed in the clinic at the present time consists of a radical mastectomy including the removal of the pectoralis major and minor muscles together with a thorough dissection of the axillary region. Following the operation the arm is bandaged to the side with the hand placed on the opposite shoulder for twenty-four hours, after which time full range of motion is obtained by gentle passive manipulation and active motion of the arm by the patient. Simple mastectomy was performed in 34 of the 196 cases with no deaths and radical mastectomy was done in 168 (bilateral in 6 cases) with 6 deaths, a mortality of 3.05 per cent for the entire group.

It appears that patients in whom the lymph nodes are not involved have a 31.9 per cent greater chance of survival than those in whom the nodes are involved. It seems that the position of the tumor in the breast is important because 73.4 per cent of the tumors with involved nodes were in the upper outer quadrant of the breast. It is also apparently significant that there were involved lymph nodes in 43.7 per cent of the patients surviving for three years and in 50 per cent of those surviving five years. This indicates the value of carefully cleaning out the axilla in all cases and not refusing operation to those patients with palpable nodes.

The authors have not employed preoperative roentgen therapy in the clinic. During the past three years all patients have received deep therapy following operation. This treatment is begun about ten days or two weeks after operation. Roentgen therapy has not interfered with the healing of the wound nor has it delayed convalescence to an appreciable degree.

JOSEPH K. NARAT, M.D.

White, W. C. Postoperative Roentgenotherapy in Cancer of the Breast. *Ann. Surg.* 1938, 108, 21.

The author believes that the Halsted type of operation is indicated in the surgery of cancer of the breast, except in the matter of skin removal. He has been content to remove a minimum width of 5 in. of skin in early cases with small tumors and then make the wide subcutaneous dissection as advocated by Handley. Except in small breasts he is able to effect a plastic closure of the skin. When the tumor is large more skin must be removed and an immediate Thiersch skin graft must be made. He believes that his percentage of local recurrence is high but no higher than that of an institution in which the typical Halsted operation is performed. No axillary recurrences were noted in 50 cases with known sites of recurrence in which the Halsted-Handley operation

had been performed. Six local axillary recurrences were noted in 69 cases with known sites of recurrence in which the pectoralis minor muscle was allowed to remain.

In the cases without axillary metastases roentgen therapy did not increase the incidence of five-year freedom from recurrence, although it gave to a small percentage of patients the opportunity to live longer. In the cases with axillary metastases roentgen therapy unquestionably resulted in an increase of 10 per cent in the incidence of five-year freedom from the disease. This finding has been a disappointment to the author inasmuch as the percentage results are poorer than those reported by him in 1927 before roentgen therapy was used routinely. He views sterilization of the patient as an encouraging approach to the elimination of regional and distant metastases present but not recognized at the time of the examination.

In his discussion Auchincloss stated that he believed that he had seen benefits derived from irradiation of cancer of the breast, but in spite of the benefits he had never seen a case proved cured by the employment of roentgen therapy alone. Practically all of the radiation is now being given to the tissues capable of being removed at operation. This means that certain conducting paths to secondary distributing foci may be radiated but if the secondary distributing foci themselves are not radiated little more than temporary benefits can accrue. He views the secondary distributing foci as the important feature of the whole subject and believes that intelligent radiation should be directed toward them.

H. ROLD C. OCHNER, M.D.

TRACHEA, LUNGS AND PLEURA

Joannides, M. The Anatomical and Physiological Structure of the Normal Lung. Résumé of Observations Based Largely on Stereomicroscopic Study of the Surface of Lungs Fixed and in the Living State. *Arch. Surg.* 1938, 37, 7.

Stereomicroscopic examination of the surface of the lung reveals an alveolus in its three dimensions and permits an actual study of its structural cellular and vascular detail.

All animals, including amphibia, have tracheas. The human trachea contains trabeculations of its inner lining which are longitudinal and extend along its whole length. The bronchi do not have such trabeculation. On looking into a terminal bronchus one sees a corkscrew-shaped tube within a tube much like a circular staircase. No evidence of intercommunication between the bronchi or bronchioles except through the parent stem was noted.

The stereomicroscopic appearance of the dry, fixed, moderately expanded lung is much like that of the cut surface of a dry commercial sponge. The bronchus and two vessels are usually found in close proximity to one another.

On surfaces made by cutting the alveoli appear as saccules, polygonal, oval, round or triangular in

tients were considered to be completely cured and 5 were benefited, 1 showed no change. The fatal cases are reported in some detail whereas the others are briefly outlined. Sebestyén also reports on 5 cases operated upon by the usual one-stage transpleural method, 2 of these patients died. After discussing the two types of operation he concludes that the extrapleural method carries less immediate risk and that it should still be included among the methods for surgically treating bronchiectasis.

RICHARD H. MEADE, JR., M.D.

Bowers, W. F. Rib Regeneration from the Standpoint of Thoracic Surgery. *Arch. Surg.*, 1938, 36: 949.

The author reviews the literature on the theories of osteogenesis and bone repair, and notes three main schools of thought.

1. Periosteal regeneration. Many authors regard the periosteum and endosteum as definite organs for the formation and repair of bone. According to this theory, osteoblasts never arise from adult bone cells, but from the cells of the periosteum and, to a lesser extent, from the endosteum.

2. Osteoblastic regeneration. The proponents of this theory uphold one of the two following opinions: (a) after injury bone cells are liberated from their lacunas, and these multiply to form new bone, and (b) after injury wandering connective-tissue cells are drawn to the site of reaction and through their pluripotentiality become osteoblasts.

3. Extracellular deposition of calcium salts. This hypothesis holds that there is no definite bone-producing cell but that after injury calcium salts are laid down in the framework of the adjacent connective tissue by chemotaxis. These connective-tissue cells then become bone cells by metaplasia, or by functional adaptation.

The results of various investigators working on the problems of bone transplantation, regeneration of bone, heterotopic osseous formation, and chemical inhibition of rib regeneration are also reviewed.

The author describes his experimental and clinical investigations, and presents the following conclusions:

Periosteum is definitely osteogenic and is a very important source of blood supply to bone.

Periosteum is the most important source of regeneration of bone and its presence is necessary for union in case of fracture.

The growth of osseous and periosteal transplants is in direct ratio to their ability to establish an adequate blood supply.

A solution of formaldehyde is superior to Zenker's solution as an inhibitor of costal regeneration, the inhibition which it produces lasting for at least four months.

The application of a solution of formaldehyde U.S.P., diluted 1 to 10, to the periosteal beds in a series of clinical cases has not been accompanied by delayed healing of the wound or by any other disadvantage. No positive results can be stated as yet,

because the series is small and the follow-up interval is too short.

The application of a solution of formaldehyde to the periosteal beds is advocated in all resections of the ribs for the drainage of empyema or abscess of the lung. It is also advocated in first-stage thoracoplasties, with the reservation that it should not be used in the bed of the first rib because of possible damage to the adjacent nerves and vessels by the formation of scar tissue.

The chemical inhibition of rib regeneration should not be employed in the Semb type of apicolysis, because in this operation the new bone aids in maintaining collapse of the lung.

JOHN H. GARLOCK, M.D.

ESOPHAGUS AND MEDIASTINUM

Ogilvie, W. H. Intrathoracic Reconstruction of the Lower Esophagus. Note on an Unsuccessful Case. *Brit. J. Surg.*, 1938, 26: 10.

The author reports a case of intrathoracic reconstruction of the lower esophagus as a surgical measure in the removal of a cancerous growth in the cardiac region of the stomach. The operation was divided into an abdominal and a thoracic stage.

A midline incision extending from the xiphisternum to the umbilicus revealed a scirrhus carcinoma about the size of a tangerine. The tumor was too wide to allow the fundus to be used as a means of anastomosis with the esophagus, consequently it was necessary to work out an alternative measure and the method of making a greater-curvature tunnel was improvised on the spot.

The greater curvature of the stomach was mobilized by division between ligatures of all the omental branches of the gastro-epiploic arch and all the vasa brevia, from a point 2 in. to the left of the pylorus up to the diaphragm. It was then turned upward, the peritoneum over the upper border of the pancreas was incised, and the left gastric artery was divided between ligatures at its origin from the celiac axis. The stomach was then divided by an L-shaped cut into two portions: a proximal one

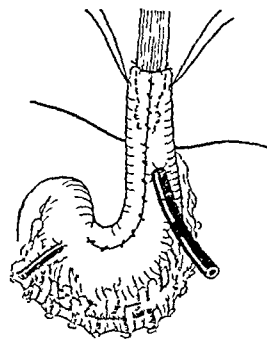


Fig. 1. The esophagus with its contained rubber tube is being "intussuscepted" into the gastric tunnel.

The importance of early diagnosis and treatment of existing sinus disease in cases of bronchitis and bronchiectasis is emphasized

J DANIEL WILLEMS M D

Rives J D Major R C and Romano S A Lung Abscess *Ann Surg* 1938 107 753

The mortality of lung abscess has not diminished appreciably in the last twenty years in spite of a marked improvement in the technique of treatment and an even more marked increase in our knowledge of its cause. Allen and Blackman's collected statistics show a mortality of 34.3 per cent in 2,114 cases and the actual situation is probably worse than those figures indicate for they were collected from the best medical centers in the nation.

The comparison of non parallel series of cases in which several authors have shown remarkably low death rates for their favorite procedures leaves much to be desired in explaining the cause of failure.

To supply that deficiency the authors present an analysis of the causes of death in 100 consecutive fatal cases of non tuberculous lung abscess exclusive of any due to tumors foreign bodies or bronchiectasis. The group of 60 cases from the Touro Clinic was completely followed up but in the Charity Hospital group of 179 cases follow up was impractical for various reasons and only the hospital mortality is presented.

The known mortality in this series is 42 per cent. It is higher before ten and after forty years of age. Approximately three times as many males as females died.

The extent of the lung involvement is the most important influence on mortality. It was a significant finding that severe infections treated early had a high mortality. Three more or less controllable factors contributed in an important degree to the mortality in this series. They are in the reverse order of their importance: anemia, empyema and spreading pneumonitis. Anemia may be readily controlled by transfusion and by adequate supportive treatment. Empyema may be avoided in most instances if surgical treatment is instituted early in superficial lesions and if needling of the chest is entirely abandoned. Spreading pneumonitis the chief cause of death may be reduced if we avoid attempts to drain the abscess cavity during the acute stage if we avoid compression therapy especially when the cavity is incompletely drained if we avoid all measures such as intermittent postural drainage likely to cause severe paroxysms of coughing while the cavity is full and if we avoid surgical drainage in the acute stage and at any time at all in deep seated abscess.

Approximately one half of the deaths in this series were probably not preventable by any method of treatment at present available but we may say fairly that in many of the remaining fatal cases the fatality might have been avoided by adequate supportive treatment combined with the judicious use of commonplace methods of bronchial or external

surgical drainage. Certain courses of action however should positively not be employed. Thus prolonged inadequate treatment invites extrapleural complications. Prolonged conservative treatment of superficial abscesses invites empyema as does also needling of the chest. Premature efforts to drain the abscess by either radical or conservative measures compression therapy employed on incompletely drained cavities surgical drainage of deeply seated abscesses and purely intermittent postural drainage all invite the deadly spreading pneumonitis which was the cause of death in four fifths of our fatal cases.

The best results will be attained by an orderly plan of treatment which utilizes supportive measures bronchial drainage and surgical drainage according to their proper indications and as they are suited to the individual case. This treatment to be continued until the abscess has completely disappeared. JOHN E. KIRKPATRICK M D

Sebestyén J. Extrapleural Lobectomy. *J Thorac Surg* 1938 7 552

According to Sebestyén of Budapest lobectomy for bronchiectasis is usually performed in central Europe according to the multiple stage extrapleural technique of Sauerbruch. The object of this method is to remove the pulmonary lobe only after it has become completely walled off by adhesions. As far as possible this resection is carried out extrapleurally but in some cases the final mobilization of the lobe must be done intrapleurally.

The author's present plan calls for a preliminary induction of phrenic paralysis. At the first thoracic operation the eventh to ninth rib with the intercostal tissues are resected for a distance of 11 cm back to the transverse processes. If the pleural space is found to be obliterated the extrapleural mobilization of the lobe can be done at this stage. However if the pleural space is found to be still open as is usually true its closure must be brought about by the formation of adhesions. At this first stage the costal pleura is separated as far as possible from the chest wall and a pack of petrolatum gauze inserted to stimulate the formation of adhesions between the visceral and parietal pleura. The wound is closed except for the lower angle. Three or four weeks later the next stage is performed. In this and subsequent stages the lobe is completely mobilized the separation being started along the diaphragmatic portion. When this mobilization has been accomplished the hilus is ligated with a rubber catheter and the necrotic lobe removed with a cautery three or four days later. The wound is packed open and allowed to heal by granulation with the constant development of a bronchial fistula. After partial filling in of the thoracic wound the bronchial fistula is closed by means of a muscle pedicled graft. The usual time required for complete healing is from four to four and a half months.

The author reports 16 cases operated upon by the extrapleural method. There were 4 deaths. Six pa-

The author discusses at some length two of the more obvious methods of esophagogastrostomy by fundus invagination. These are the method of direct invagination by purse-string suture and the trap-door method. Both have advantages and drawbacks.

Surgeons doing a great deal of gastric surgery will agree with Finney that "the stomach is a very viable organ." It is remarkable that all its arteries may be ligatured, yet it bleeds copiously when cut, that its walls may be divided in any plane and anastomosed to any part of the small intestine at any angle, yet they never slough.

When the author found it necessary to improvise an expedient in the operative case cited, the method of making a greater-curvature gastric tunnel suggested itself to him as a means of esophageal reconstruction having manifest advantages. The tunnel is well supplied with blood, it is mobile, and of a length far in excess of any that can conceivably be required. Moreover, it employs part of the stomach wall that is well away from the zone of spread of a tumor growth, its diameter does not demand any great enlargement of the esophageal hiatus in the diaphragm, and it allows a method of suture that is amply secure, that puts no tension on the esophagus, and that is almost immune from soiling by esophageal contents (Fig. 2).

MATHIAS J. SEIFERT, M.D.

Maier, H. C. • Mediastinal Hernia in the Absence of Pneumothorax. *Am J Roentgenol*, 1938, 39 687

Mediastinal hernia is the protrusion of a portion of the contents of the pleural space of one hemithorax with evagination of the mediastinal pleura through the mediastinal partition into the contralateral hemithorax. Mediastinal herniation should not be confused with the deviation of the mediastinum that is common in thoracic disease. Packard, Doub, Jones, and others have shown that it occurs not uncommonly during the administration of therapeutic pneumothorax. This article limits its discussion to mediastinal herniation in cases without pneumothorax. It has not been generally recognized that herniation may develop as a result of pathological processes within the thorax in the absence of pneumothorax or previous operative procedure.

It is of clinical importance to recognize mediastinal hernia in the absence of pneumothorax because an attempted therapeutic pneumothorax in such a case may produce a contralateral pneumothorax. This may occur during a pneumonectomy when the opposite pleural cavity may be opened inadvertently. If the operator should be unaware of a mediastinal herniation caused by an empyema, serious complications may follow the inadvertent surgical exposure of the opposite uninfected pleural space.

Anatomically, the structures throughout most of the mediastinum form a rather effective barrier between the two pleural cavities except for three weak places where only loose connective tissue separates

the parietal pleura. One area lies directly behind the sternum and extends between the first and the third ribs and, occasionally, to the diaphragm. Another weak place is between the aorta and the esophagus, extending between the levels of the fifth and the eleventh thoracic vertebrae. This hernia occurs less frequently than the former and tends to be smaller. It practically always extends from right to left and not in the opposite direction because pressure from the left tends to overlap the esophagus on the aorta and thereby close the defect. The third weak spot is between the esophagus and the vertebrae, extending between the third and fifth thoracic vertebrae. It is rare at this site according to Barsony and Wald.

Pathological processes causing a considerable diminution in the volume of one lung tend to induce herniation of the opposite lung through the mediastinum. Mediastinal herniation in the absence of pneumothorax is usually seen in conditions in which the pressure difference in the two pleural cavities has existed for a considerable period of time.

Mediastinal hernias may be divided into two groups.

In one group the protrusion is toward the normal or less involved side, as in certain cases of massive or encapsulated empyemas and in pneumothorax. These have been called pulsion hernias.

In the other group the protrusion of the compensatorily enlarged contralateral lung is toward the diseased or more involved side. In such cases there is usually a deflation or fibrosis of a considerable portion of one lung so that it occupies a smaller space than formerly. Here one is dealing with an adjustive mechanism of the same type as that described by Rienhoff after pneumonectomy and post-traumatic atrophy of the lung. The more common etiological factors are tuberculosis with advanced pulmonary fibrosis, and lesions producing bronchial obstruction with resultant atelectasis.

The possibility of the existence of a mediastinal hernia should be borne in mind in any patient with thoracic disease possibly affecting a change in the position of the mediastinum. There are no physical signs which are pathognomonic of mediastinal herniation. The physical signs are often interpreted as an uninvolved portion of the lung on the affected side which exhibits breath sounds rather than a herniation of the opposite lung. The diagnosis of mediastinal hernia rests almost entirely upon roentgenological findings. Routine chest films conceal the presence of herniation. Only by using stereoscopic roentgenograms with the Potter-Bucky diaphragm may the hernia be located in relation to its anterior or posterior "weak place." In cases of pneumothorax the film should be taken during expiration and in those without pneumothorax the hernia is larger during inspiration. Bronchoscopy may give additional corroborative evidence in the diagnosis of mediastinal herniation. In cases of large anterior hernia the carina is usually rotated. Iodized oil may be an aid to diagnosis in demonstrating the

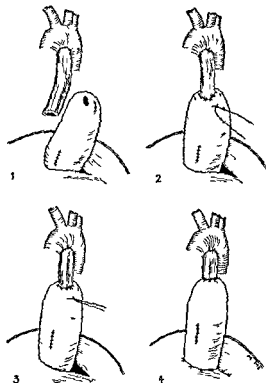


Fig. 2. Esophago-gastric stomy by fundus invagination.

including most of the fundus and half of the lesser curve and a distal one the shape of a pistol upside down, the handle represented by the pars pylorica and the barrel by a long tube of greater curvature carrying the gastro-epiploic arch. The stomach was divided and the upper proximal portion was oversewn somewhat roughly to reduce its size and to prevent leakage; the lower part was sutured with considerable care. Both parts remained temporarily attached by a 3 in. length of stout silk doubled. A No. 12 de Pezzer catheter was then inserted through a small independent incision in the anterior wall of the stomach $2\frac{1}{2}$ in. proximal to the pylorus and secured by a double invaginating purse string suture. The tube clamped with Spencer Wells forceps was dropped back into the abdomen. The incision was closed with three stitches of stout silk-worm gut passed through all layers of the abdominal wall.

The chest was then opened by a long incision in the seventh intercostal space. The esophagus was isolated halfway between the aortic arch and its lower end and a length of rubber tube was passed around it. The esophageal opening in the diaphragm was incised and by traction on the esophagus the closed proximal portion of the stomach was drawn through the enlarged opening into the thorax, bringing with it the attached greater curvature tunnel.

The cardiac portion of the stomach and lowest $1\frac{1}{2}$ in. of esophagus were then removed. A flanged rubber tube was passed into the esophagus until the flange lay half an inch inside. The cut end of the esophagus was tied around the tube below the flange with three ligatures of No. 4 silk.

The tip of the gastric tunnel was then cut off. By means of a pair of forceps passed through a stab incision in the anterior wall of this tunnel the esophagus with its contained rubber tube was intussuscepted into the gastric tunnel. The cut end of the esophagus was sutured to that of the tunnel with three catgut stitches passed under the esophageal silk ligature and through all coats of the stomach. The esophagus was held down by traction on the rubber tube while the stomach tunnel was pulled up with forceps on each side about 1 in. down from its free end. The invagination thus produced was secured by two or three stitches from the stomach to the esophageal wall and the process was then repeated, another inch of stomach tunnel being drawn up around the esophagus.

The left phrenic nerve was crushed where it lay on the pericardium. The incision in the diaphragm was sutured in order to reduce the opening to the diameter of the greater curvature tunnel and the opening was stitched to this tunnel above the emerging esophageal tube. A No. 12 de Pezzer catheter was passed through a stab wound in the tenth left intercostal space and the wound closed completely.

The abdominal incision was then re-opened. The esophageal tube was brought to the surface through a stab wound just below the left costal margin in the midaxillary line. The gastrostomy tube was taken through a separate small incision in the right rectus muscle. The incision was closed without drainage (Fig. 1).

The author reports the operation to be a failure. The patient died from pulmonary complications. Immobilization of the left diaphragm and the intravenous administration of too large a volume of saline solution were contraindicated. The author points out that crushing the phrenic nerve was unnecessary. He also says that this step was most likely unwise since it must have hindered re-expansion of a collapsed lung.

All the fluids required by the patient could have been given by the gastrostomy tube. The intravenous route while convenient and in most cases necessary nevertheless carries considerable risk of interference with the balance of salts and colloids in the tissues and ultimately causes edema.

The author explains why reconstruction of the lower end of the esophagus almost invariably meets with failure as follows. The oesophagus comes down like a rubber tube but like rubber it immediately recedes when the pull is relaxed. It is possible with the abdominal approach to make a complete gastrectomy and suture the jejunum or even the duodenum to the esophagus. This has frequently been done. The unpublished fatalities however greatly outnumber the successes.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Williams, C · The Advantages of the Abdominal Approach to Inguinal Hernia *Ann Surg*, 1938, 107 917

The abdominal approach to the sac of an inguinal hernia has many advantages which are not generally appreciated

It is advocated in the cases of patients in whom the appendix should be removed, or in cases in which the appendix is suspected of having been inflamed. It is used in all cases of strangulated hernia. The advantage is that the bowel is entirely under control at all times, the internal ring can be more readily released, and the canal portion of the sac can be opened at the same time if the bowel is caught by a lower ring or is adherent in the sac. Finally, if resection is necessary, a good exposure of the mesentery is obtained, whereas this is often quite difficult through the sac from below

The method has an advantage in cases of large indirect hernia, particularly if there is incarceration of the abdominal organs. In sliding hernias, it is easy to visualize the advantage of delivering the sigmoid or cecum from above. In the approach of a congenital type of hernia from above, the neck of the sac can be dissected above the point of contact with the vas, so that any tearing would be downward and of no consequence since some of this sac must be left in place

The advantages of the abdominal approach in the case of undescended testicle are the same as for congenital hernia. In addition the peritoneum can be pushed upward on the posterior abdominal wall and a wider exposure made of the vas and the spermatic blood vessels. The adhesions which are so often present can be divided, unimportant veins can be removed, and with this wider dissection greater length of the cord can be obtained

CHARLES BARON, M D

Giupponi, E Encapsulating Chronic Peritonitis (La peritonite cronica incapsulante) *Polidn*, Rome, 1938, 45 sez chir 267

The author reports 4 cases of encapsulating chronic peritonitis, 3 with partial involvement of the intestines and 1 with total encapsulation. In these patients a new peritoneal membrane encapsulated various portions or all of the intestines. The membrane was smooth, transparent, thick, slightly contracted, loosely adherent to the parietal peritoneum, and densely adherent to the mesentery and intestine at their entrance and exit from the encapsulating membrane. Histologically the membrane was a connective-tissue lamina which was more or less vascular and lined with endothelial cells on the inner surface. The condition corresponded to the "Zuckergussdarm" of the Germans

The pathogenesis of this condition is unknown. In the 4 cases reported the Wassermann reaction and all bacteriological tests were negative. The skin tests for tuberculosis were negative in 3 patients and only mildly positive in 1

Clinically the most characteristic physical finding in these patients was a rounded, smooth, tympanitic mass. X-rays were of definite benefit by revealing the outline of this mass and the encapsulated nature of the loops of intestine

The treatment of this condition involves the surgical excision of the membrane. After excision, unlike ordinary adhesions, the membrane does not recur. In cases in which the peritonitis is total the removal may require several operations

A LOUIS ROSI, M D

Beluffi, E L · The Mesenteriolitis Accompanying Appendicitis (La mesenteriolite appendicolare) *Arch ital di chir*, 1938, 48 697

Beluffi studied histologically the mesenteriola of 245 appendices which had been surgically removed. Various forms of appendicitis were observed in this respect and the following conclusions were drawn

Every inflammatory process of the vermiform process is accompanied by demonstrable lesions of its corresponding mesenterium, the lesions varying from case to case and according to the type of appendicitis. In general, the severity of these lesions is proportional to the intensity of the anatomicopathological process occurring in the wall of the vermiform process

Following an attack of appendicitis there persist in the meso-appendix certain structural changes which often permit a retrospective diagnosis of a previous attack of appendicitis. It is interesting to note that for each phase and for each form of appendicitis there exist characteristic morphological pictures which are in many instances superimposed upon one another as the result of the reiteration of attacks

In the acute phase of appendicitis the reactions in the mesenterium include edema, exudation, infiltration, lymphangitis, rapid mobilization of the reticulo-endothelial elements, and perivascular infiltrations. In more severe cases there is an impairment of the circulation and a thrombosis of the venous radicles which may lead to a purulent mesenteric thrombophlebitis and a hepatic abscess

After subsidence of the acute process there may be recognized, even a long time after the attack, histological changes in the form of thickening of the connective tissue and of the blood-vessel walls and follicular infiltrates. Macroscopically, these old lesions appear in the form of shortening adhesions and retractions which all tend to alter permanently the anatomical relationships and the physiological properties of the vermiform process

protrusion of the herniated lung through the mediastinum. Mediastinal herniation must also be considered in the interpretation of roentgenological shadows.

In cases of mediastinal hernia without pneumothorax the herniation itself requires no treatment. Treatment of the diseased lung however will often be necessary. Knowledge of the existence of mediastinal herniation may prevent injury to the herniated normal pleura at the time of an intrathoracic operation or induction of an anterior pneumothorax.

The clinical significance of mediastinal hernias lies in the fact that they may be confused with a pulmonary cavity on a roentgenogram. In emphysemas which protrude through the mediastinum the appearance may simulate that of a mediastinal abscess or even a bilateral empyema. In cases of pulmonary tuberculosis treated by thoracoplasty herniated normal lung might be interpreted as being inadequately collapsed diseased lung on the thoracoplasty side.

The author reports 7 illustrative cases in detail and presents typical roentgenograms of the three types of mediastinal hernia selected from a group of 30 cases in which pneumothorax was not present.

JOHN E. KIRKPATRICK, M.D.

Ljvraga P. Anterior Longitudinal Mediastinotomy
(Contributo alla conoscenza della mediastinotomia anteriore longitudinale) *Clin. chir.* 1938 14 257

Ljvraga points out that in the past surgeons were hesitant to penetrate into the thoracic cavity because of certain insurmountable difficulties such as the presence of the heart and the great vessels, the endopleural negative pressure and the osseous framework of the thoracic cage.

In the course of the last few years however various surgeons have successfully performed lobectomies for the removal of malignant pulmonary tumors and the treatment of tuberculosis. Of the various ways of approaching the thoracic cavity the author gives preference to an anterior longitudinal thoracotomy with section of the sternum. This method originally devised by Milton has now been commonly accepted. With this mode of approach a sufficiently wide operative field is obtained and the various endothoracic viscera may be conveniently exposed.

The indications for this operation include (a) diseases of the great vessels (b) inflammatory or neoplastic processes of the anterior mediastinum (c) traumatic lesions of the heart and the lungs and (d) wounds or tumors of the lung.

The operation as performed by Marro may be briefly described as follows.

A median incision is made which extends from the inferior margin of the thyroid cartilage to the ensiform process. The sternum is bisected with a saw and with the aid of a bone chisel. The sectioned parts of the sternum are retracted and the posterior and interclavicular ligaments are severed. The delicate pleural reflection is peeled off with the aid of the fingers, special care being taken to avoid tears. In repairing the wound the sectioned sternal margins are approximated and are sutured with metallic stitches which are introduced with the aid of a perforator. The overlying fascia and skin are repaired in the usual manner.

Ljvraga presents the case reports of 2 patients who were operated upon in this fashion. The first patient presented a lymphosarcoma occupying the anterosuperior mediastinum whereas the diagnosis in the case of the second patient was a large retrosternal sarcoma. Following an anterior longitudinal mediastinotomy a biopsy specimen of the tumors could be obtained. Following irradiation both patients made an uneventful recovery.

German surgeons describe 3 varieties of anterior longitudinal mediastinotomy: (1) total anterior longitudinal mediastinotomy (Schoene) (2) longitudinal anterosuperior mediastinotomy and (3) longitudinal antero-inferior mediastinotomy (Sauerbruch). Various other methods have been described.

In the author's opinion anterosuperior longitudinal mediastinotomy gives the most satisfactory results. In this operation the sternal heads of the sternocleidomastoid muscles are resected under local anesthesia, the superficial veins are ligated and with the aid of the fingers the posterior surface of the sternum is carefully freed from the underlying pleura and the great vessels. The internal mammary vessels are either pushed laterally or they are ligated. Subsequently the sternum is sectioned by means of a sternotomy. The operation is indicated especially in aortic aneurysm, in neoplasms of the mediastinum and in various carcinomatous processes involving the lungs and their hila. RICHARD E. SOMMA, M.D.

emptying time of the stomach seem also to be influenced by the degree of filling of the small intestine. In general, however, no strict relationship is observed between the emptying time of the stomach and its increase of tone and peristalsis.

Concerning the relationship of the pylorus to the ileocecal valve, Becchini finds that, in general, an increased pyloric activity corresponds to an increased functional activity of the ileocecal valve, but the aforementioned activities are by no means synchronous. The influence exerted by the small intestine upon the stomach can be well illustrated chemically by the hypertonia, hypercinesia, and peristaltic arrhythmia of the stomach in cases of duodenal ulcer.

In the author's opinion, the so-called ileal reflex is elicited primarily by stimulation of the pylorus and duodenum rather than by stimulation of the stomach. The reflex is therefore most appropriately called pyloroduodeno-ileal reflex.

Concerning the great variety of intestino-intestinal reflexes, not enough is known to establish any generalizations, but from a large number of isolated physiological and pathological facts it may be safely concluded that in reality these reflexes exist.

In studying the functional relationships between the stomach and the colon and *vice versa*, Becchini finds that gastric distention produces, as a rule, inhibition of the colon, especially in its ascending portion, loss of tone, and cessation of the contractions. Concerning the inverse relation (colicogastric reflex), it is found that the filled colon produces reflexly an increased tone in the stomach. The latter's emptying time is retarded because of inhibition of the gastric motility which follows immediately after the period of relative hypertonicity and hyperperistalsis.

Concerning the appendicogastrocolic reflexes, the inflamed appendix is a greater source of gastric reflex impulses than the normal one. A marked hypotonia or hypertonia of the stomach is produced, whereas no changes of the peristalsis occur. A constant finding in appendicitis, however, is a spasm of the inferior portion of the duodenum. The inflamed appendix also sets up reflexes referable to the colon. A hypertonia or spasm is usually produced which may involve any segment of the large intestine. A few investigators have reported a diminution of the diaphragmatic excursions in cases of acute appendicitis which may be considered a defensive reaction.

Concerning the gastro-appendicular reflexes, the author finds that the filled stomach produces a reflex activity of the appendix which appears to be intrinsic and which is not caused by a movement passively imparted by adjacent intestinal loops.

Becchini also studied the reflex activity of the peritoneum on dogs and he found that following mechanical and chemical stimulation of the latter, there was a marked increase in tone and motility of the entire intestinal tract, especially the colon. Also, the small intestine showed a greater tone and motility, whereas no changes were observed in the stomach.

Concerning the cholecystogastro-intestinal functional relations and *vice versa*, the author states that a normal gall bladder probably does not exert any reflex activity, whereas clinically it is well known that in cases of cholecystitis and cholelithiasis there occur profound functional disturbances involving the gastro-intestinal tract. Although the author was unable to produce any functional changes either in the stomach or in the intestine following electrical stimulation of the gall bladder in a normal morphinized animal, he firmly believes that the irritated gall bladder produces a marked gastrospasm involving especially the larger curvature, whereas cardiospasm and pylorospasm, in his opinion, occur more rarely.

Conversely, the colon as well as the upper portion of the gastro-intestinal tract (buccal mucosa, esophagus, and duodenum) is capable, upon stimulation (even psychically), of producing a reflex activity of the gall bladder. In demonstrating these phenomena, the author has carefully eliminated all possible chemical factors.

Becchini finally studied the functional relationship of the kidneys and the urinary passages to the gastro-intestinal tract. It is well known that surgical interventions as well as trauma involving the urinary system may elicit acute gastro-intestinal manifestations. In the rabbit and in the dog, the author was unable to observe any functional changes in the various segments of the gastro-intestinal tract following electrical stimulation of the kidney or its hilus.

In spite of these findings, which may have been partly due to the effect of the narcotic, there is sufficient evidence in support of the theory that the genito-urinary tract may affect reflexly the gastro-intestinal tract. The renodigestive reflexes have been classified according to a group of investigators as follows: (1) renogastric reflexes which may be motor, secretory, or vasomotor, (2) reno-intestinal reflexes which may be also motor, secretory, or vasomotor, producing especially a spasm or a paralysis of the large intestine, and (3) peritoneal reaction of renal origin, determined by the association of renogastro-intestinal reflexes with cardiorespiratory or vasomotor reflexes.

In general it is claimed that the pylorus and the large intestine are especially sensitive to these stimuli. It is believed that constitutional and hormonal factors also enter into this rather complex mechanism.

RICHARD E. SOMMA, M.D.

Bologna, A., and Costadoni, A. - The Gastropancreatic Function in Patients with Heart Disease (Osservazioni sulla funzione gastro-pancreatica nei cardiopazienti). *Arch. ital. di mal. dell'appar. digerente*, 1938, 7, 215.

It has been repeatedly pointed out that heart disease is sometimes complicated by digestive disturbances. According to Bologna and Costadoni, the various gastralgias observed in cardiac patients are usually due to atheromatosis or arteriosclerotic

The aforementioned cicatricial changes of the mesenterium resulting from the local repair reflect upon the appendix and produce various mechanical and functional disturbances which favor stasis of the secretions and which predispose to future attacks.

Beluffi believes that the typical tenderness observed in cases of acute or chronic appendicitis is due primarily to the pathological processes occurring in the mesenterium. He furthermore believes that the persistence of exudate around the mesenterium is probably responsible for the propagation of the infection by continuity to other viscera of the right abdomen occurring either by direct extension or by way of the blood and lymph streams. He therefore advises that in patients presenting extensive involvement the mesenterium should be removed as completely as possible and the denuded surface carefully repaired with a suitable peritoneal flap.

RICHARD F. SOMMA, M.D.

Fiorini E. Chylanglectasia and Cystic Lympho-Angio Endotheliomas of the Mesentery (*Chylanglectasia e linfangio endotheliomi cistici del mesenterio*) *Arch ital di chir* 1938 48 758

Cystic formations of the mesentery are not as rare as is commonly believed. Various classifications based on anatomicopathological etiologicopathogenic and clinical criteria have been proposed but in order to avoid confusion Fiorini offers a practical and simple classification of mesenteric cysts: (1) lymphatic cysts (serous serohematic and chylous); (2) enteroid cysts; (3) wolffian cysts; (4) dermoid cysts; (5) teratoid cysts; (6) parasitic infestations leading to cyst formation (echinococcus and cysticercus); and (7) gaseous cysts.

The opinions of the various authors concerning the incidence of mesenteric cysts differ widely. These cysts are most commonly encountered in individuals from five to twenty years old and they are usually found to involve the mesentery of the small intestine and especially the terminal portion of the ileum. Females are more frequently affected than males; the incidence in females amounting to about 65 per cent.

Macroscopically lymphatic cysts of the mesentery appear as a mass containing one or several cavities. The individual cavities communicate with one another and contain usually a clear yellowish or opalescent milky white fluid. Histological examination reveals that the thin cystic wall is made up of three layers: an external one continuous with the peritoneal serosa and made up of adult connective tissue; a middle one made up of young connective tissue containing many blood vessels and lymphatic spaces; and an internal one made up of endothelial cells arranged in a mosaic like fashion. The fluid in the cavity contains albuminoid and fatty substances, salt, and certain extractives whose proportions vary according to whether the liquid is lymph or chyle.

It is difficult to draw a clinical picture of this condition. In some patients the cysts produce no symptoms; in others the most common complaints are vague abdominal disturbances, constipation, meteorism, nausea, and pain which has a periumbilical distribution and which may radiate to the inguinal and lumbar regions. In severe cases vomiting and diarrheic crises have been reported. On palpation the presence of a fluctuating mass can often lead to a correct diagnosis. X-ray films may be of value in confirmation of the diagnosis made on physical examination. In all cases however the diagnosis is made with difficulty and the condition is often discovered accidentally during a surgical intervention.

Fiorini reports 2 cases of mesenteric cysts observed in 2 boys six and eleven years of age respectively. In both patients the cysts were found to involve the mesentery of the ileum. In one a chyliferous cyst was present and in the other the lesion appeared as a huge aggregation of lymphatic cysts. The first case remained undiagnosed whereas the second was diagnosed as intestinal intussusception. In the former the chyliferous cyst was enucleated; in the latter an extensive enteromesenteric resection was performed. Both patients made an uneventful recovery. Examination revealed adenochylangioma of probable congenital origin in both cases.

The author concludes that multiple mesenteric cysts containing lymph or chyle should be considered as congenital neoplasms with a slow course of evolution. The ectasia attacks not only the connective tissue and muscular tissue lymphatics but also the perivascular perineural and lymphoglandular lymphatics.

RICHARD E. SOMMA, M.D.

GASTRO INTESTINAL TRACT

Becchini G. Viscerovisceral Correlations (*Sulle correlazioni visceroviscerali*) *Arch ital di mal dell'apparato digerente* 1938 6 523 7 104 122

The existence of certain viscerovisceral reflexes was demonstrated as early as 1910 when a group of investigators observed acid dyspepsia in patients with appendicitis. This was definitely attributed to an appendicogastric reflex. Since that time many more observations have been made regarding the functional interrelationships between the various segments of the gastrointestinal tract and between certain abdominal organs which are not part of the latter.

Becchini does not consider the chemical factors involved in this reflex mechanism limiting himself only to a discussion of the dynamic aspects of the problem. This study is based primarily upon the roentgenological manifestations of phenomena such as changes in tone in peristalsis in the emptying time and in the appearance or disappearance of spasticity. The aforementioned phenomena may not be constantly observed in all individual and in some cases they may be entirely absent.

Becchini discusses first the functional interrelationships between the stomach and the small intestine and *vice versa*. He finds on the basis of roentgenological evidence that in the majority of the cases the tone of the stomach is increased if the small intestine is filled. The peristalsis and the

is developed adequately. Macroscopic examination was found to be of little value, and even the characteristic microscopic features of chronic calloused peptic ulcer were found to be duplicated in ulcerated carcinoma. This observation was confirmed by 100 surgical specimens of primary gastric carcinoma examined by Klein. Among these 100 cases the muscularis mucosae and the muscularis propria showed close approximation in only 3 specimens. Klein considers this finding to be in disagreement with Newcomb's contention that this sign is pathognomonic of primary peptic ulcer even though he failed to observe it in 97 of 100 primary gastric carcinomas. The conclusion is then drawn that there is the possibility of marked similarity between primary peptic ulcer and ulcerated carcinoma. There is, therefore, no specific anatomical feature which would indicate the pre-existence of a benign lesion, and the most conservative and critical criteria should be utilized in diagnosing ulcer-carcinoma.

The criteria of Hauser, Barrman, Anschutz, and Konjetzky are next presented. They stipulate that in addition to the presence of characteristic features of chronic peptic ulcer, the carcinoma must be localized to a narrowly circumscribed marginal area of the ulcer, while the base is entirely free of carcinoma or is, at least, only slightly infiltrated adjacent to the focus of origin of the tumor. Such a picture is, of course, seen only in carcinoma in the early stage. The finding of the so-called "ring" form of carcinoma which consists of a cancer-free typical peptic ulcer base surrounded by a residual circle of neoplastic tissue is also not considered pathognomonic of carcinoma-ulcer. Extensive ulceration occurs in gastric carcinoma, and it is probably more logical to account for the incomplete circle on the basis of additional destruction of part of the circumference of the carcinomatous ring.

The author therefore concludes that there is a possibility that carcinoma originating in peptic ulcer may not exist, and he then presents a study based on 1,057 gastrectomy specimens and 4,400 autopsy specimens. Sections were made in such a manner that the entire suspected lesion could be reconstructed. This would localize the malignant cells in the lesion. From this material the author found that in a series of 141 cases of chronic gastric ulcer and 353 cases of gastric carcinoma there were but 2 cases in which the diagnosis of ulcer-carcinoma could be suggested on a basis of certain pathological criteria. He therefore concludes that if malignant degeneration of chronic gastric ulcer occurs at all, it is extremely rare, and because of the rarity of proved ulcer-carcinoma there is insufficient justification for early radical surgical treatment of gastric ulcer based on the possible danger of malignant degeneration.

SAMUEL J FOGELSON, M D

Eggers, C. Gastro-Enterostomy. *Ann Surg*, 1938, 108, 84.

This contribution is based on 84 operations, 12 of which were performed for inoperable cancer, which

leaves 72 cases for consideration. These were complicated by the following conditions:

The development of lung abscess with subsequent recovery in 1 patient, postoperative hemorrhage, vicious circle, and evisceration in 1, cardiac infarction in 2 patients, suppurative parotitis in 2, and very severe postoperative hemorrhage in 2 others, one of whom died, while the other recovered following re-operation.

In this series of 72 patients, a gastrojejunal or jejunal ulcer which could be diagnosed definitely was never encountered, though in the cases of 2 patients the presence of a marginal ulcer was suspected. There were 3 (4.1 per cent) deaths.

The majority of the patients have been followed up since their operations and the general impression of the author is that "there has been restitution of health in at least 90 per cent of the patients, even though jejunal ulcer may follow gastro-enterostomy more frequently than is reported."

SAMUEL J FOGELSON, M D

Mixer, C G, and Starr, A. Further Experience with Regional Enteritis. *New England J M*, 1938, 219, 37.

The authors have studied and treated 20 cases of regional enteritis. The disease is essentially one of youth. Eleven of the authors' patients were under twenty-five and 7 were between twenty-five and thirty-five years of age. The etiology of the disease still is uncertain. The lesion most often involves the terminal ileum, stopping abruptly at the ileocecal valve, where the process shows its greatest activity. The disease is progressive, lasts for months or years, and tends to fall into four phases.

The first stage is that of an acute intra-abdominal lesion with evidences of peritoneal irritation. Acute pain in the right lower quadrant, vomiting, fever, leucocytosis, and abdominal tenderness and spasm may be present. The disease in this stage resembles acute appendicitis. At operation, an excess of free peritoneal fluid is found and the terminal ileum is reddened and thickened. Invariably enlarged mesenteric glands are seen.

As the disease advances, the symptoms are those of mild idiopathic ulcerative colitis, i.e., frequent loose bowel movements, recurrent bouts of fever, cramp-like abdominal pain, progressive weakness, and loss of weight, but there is no tenesmus. Lower abdominal tenderness usually is present, and a mass may be palpated by abdominal or rectal examination. Proctoscopy fails to show the usual lesions of ulcerative colitis in the lower bowel. Anemia and leucocytoses are common. At operation the terminal ileum is thickened and edematous, with corresponding involvement of the mesenteric lymph glands. Many ulcerations are found in the mucosa of the diseased bowel.

The third stage is that of chronic partial intestinal obstruction as the result of extreme thickening of the wall of the bowel and scar formation from the healing of the mucosal ulcerations. The constriction is

processes of the abdominal aorta and its visceral branches. The pathogenetic mechanism is obscure and the explanation of it is difficult because of the complexity of factors which enter into play. It is probable that in many cases the physiopathological changes in the stomach are analogous to those observed in intermittent claudication: the arteries of the stomach present arteriosclerotic changes and consequently the blood supply to this organ is seriously disturbed. The patient therefore complains of pain which at times may become very distressing. Unfortunately however there are other cases in which this explanation is inadequate and in which the gastric symptoms are directly due to the arteriosclerotic involvement of the coronary vessels of the heart.

Of greater interest are the various forms of dyspepsia which are often encountered in heart disease. They are observed in practically all types of heart disease such as endocarditis, myocarditis or pericarditis. Physiopathologically the dyspepsia is due primarily to the circulatory insufficiency which in turn produces a passive congestion of the gastric mucosa. Obviously the stasis is accompanied by profound functional changes.

In some cases the gastric disturbances are overshadowed by the more dramatic symptoms of heart disease such as dyspnea so that the physician may fail to obtain a history of gastric involvement. In other cases conversely the gastric disturbances prevail and may be so marked as to mask the underlying cardiac condition.

The diagnosis of these gastric disturbances is easy if the possible causes of error are eliminated. As a rule the dyspepsia of cardiac origin is resistant to any specific treatment.

Autopsy findings have shown conclusively that pathogenetically the disturbance is due to passive congestion. This can also be confirmed by the following clinical findings in severely decompensated cases with peripheral edema: free hydrochloric acid in the stomach is more or less absent, the total acidity is low and there may be traces of lactic acid; proof of a certain degree of gastric retention. Histamine injections give a sluggish response if any at all. In mildly decompensated cases there may or may not be gastric hypofunction whereas in compensated cases the functional activity of the stomach is unaltered.

The authors state also that in treated cases of cardiac decompensation the injection of histamine is followed by a normal response provided that the gastric mucosa has not been permanently injured as the result of prolonged stasis.

Inasmuch as the action of the digitalis bodies is known to be destroyed under the influence of the gastric juice it results that these cardiotonics exert a more therapeutic effect in completely decompensated cases in which the gastric acidity is reduced to a minimum.

Concerning the behavior of the pancreas in heart disease the authors claim that the external as well

as the internal secretion of this gland becomes impaired in severely decompensated cases and if the passive congestion persists for a long period of time the pancreatic gland may undergo permanent and irreversible anatomical changes.

It should be clearly understood that all the aforementioned phenomena are not directly related to the underlying heart disease but that they result from the passive congestion of a failing circulation.

RICHARD E. SOMMA, M.D.

Klein, S. H. The Origin of Carcinoma in Chronic Gastric Ulcer. *Arch. Surg.* 1935, 37, 155.

An excellent review of the literature with emphasis upon the most important contributions is used to introduce the subject of the origin of carcinoma in chronic gastric ulcer. First comes Newcomb's comprehensive survey listing 51 observers who stated that not more than 10 per cent of gastric carcinomas arose in peptic ulcers, 74 who believed the incidence to be less than 20 per cent and 15 who recorded figures exceeding 50 per cent.

Then follow Hauser's statistics which are based on a pathological anatomical study of a large series of ulcers from several German Clinics. It showed that 3.4 per cent of 1,774 gastric ulcers had carcinomatous changes, an average incidence of 2 per cent. There is also included the extremely valuable observation of Anschütz and Konjetzny showing that from 3.3 to 6.0 per cent of the cases showed carcinoma later after a gastro-enterostomy was performed for an ulcer. In this series carcinoma occurred in from 2.5 to 4.9 per cent of the cases within two years. In from 1.1 to 3.4 per cent it occurred after a longer interval. Only in this latter group could the lesion be assumed to be a carcinoma *ex ulcere* because Hauser believed that if the carcinoma occurred within two years after the gastro-enterostomy it could well have been present at the time of the operation.

Histologically a chronic gastric ulcer should have a base almost entirely free of muscularis. The segment of the muscularis corresponding to the area of the ulcer is usually completely destroyed; the free ends of the muscularis layer characteristically bent upward into the ulcer margin being sharply demarcated against the connective tissue of the base. This is in contrast to the condition seen in many carcinomas in which there is retention of the muscularis in the base with splitting and separation of the muscularis fibers with infiltrating cells.

Newcomb has added another feature which he considered pathognomonic for benign chronic gastric ulcer. This was the close approximation or apposition of the muscularis propria and the muscularis mucosae at the top of the ulcer produced by the contraction of scar tissue in the presence of healing. He has reported this finding in some part of all but 15 per cent of 154 chronic gastric ulcers. Other investigators have however failed to observe this.

The diagnosis of carcinoma *per se* is not considered in this article but the diagnosis of ulcer carcinoma

head forward When no polyps or tumors are present it is difficult to assign a definite reason for the intussusception In such cases sudden hyperactivity in an intestine with an abnormally long mesentery or a defect in its wall has been considered the most likely cause

Four types of intussusception are described

- 1 Ileocecal, the ileocecal valve and the adjacent ileum pass into the cecum and colon
- 2 Ileocolic, the ileum alone prolapses through the ileocecal valve into the colon
- 3 Colic, the large bowel is prolapsed into itself
- 4 Enteric, or ileal, the small bowel alone is involved

The treatment is usually surgical If the condition is seen and diagnosed very early, especially in children, repeated enemas may bring about reduction In most cases, however, when the physician sees the patient adhesions have already formed, and inflammation and edema are present, so that only by surgical means can a reduction be effected Since most intussusceptions are due to tumors or polyps, resection of the mass is the usual procedure

The author reports a case of intussusception in a man, thirty-five years of age The patient had a history of partial intermittent obstruction The cramp-like pains appeared at irregular intervals and lasted from five to fifteen seconds These symptoms increased in frequency until at the time of admission to the hospital they occurred almost every five minutes without any relation to meals Alkalies and food seemed to have no effect on the symptoms The patient had two or three loose bowel movements per day, and sometimes these were tinged with blood He lost 30 lbs in weight during six months of illness Dyspnea and general weakness were present The physician found nothing abnormal on physical examination, but a blood count showed the hemoglobin to be only 40 per cent A few months of treatment raised the hemoglobin to 60 per cent, at which level it persisted until the patient was admitted to the hospital Examination of the heart and lungs showed these to be normal Examination of the abdomen revealed a soft, elongated mass above the umbilicus, quite tender and extending across the midline Laboratory examinations at that time showed no pathological changes in the urine with the exception of a few coarsely granular casts Gastric analysis disclosed a low acid value The stool at the time of examination showed no occult or gross blood

MATHIAS J SELFERT, M D

Woodhall, B Modified Double Enterostomy (Mikulicz) in Radical Surgical Treatment of Intussusception in Children *Arch Surg*, 1938, 36 989

The high mortality which follows resection of gangrenous or irreducible intussusception in infants and young children is sufficient reason for a determined effort to improve the surgical technique In the treatment of such lesions, the following methods have been employed

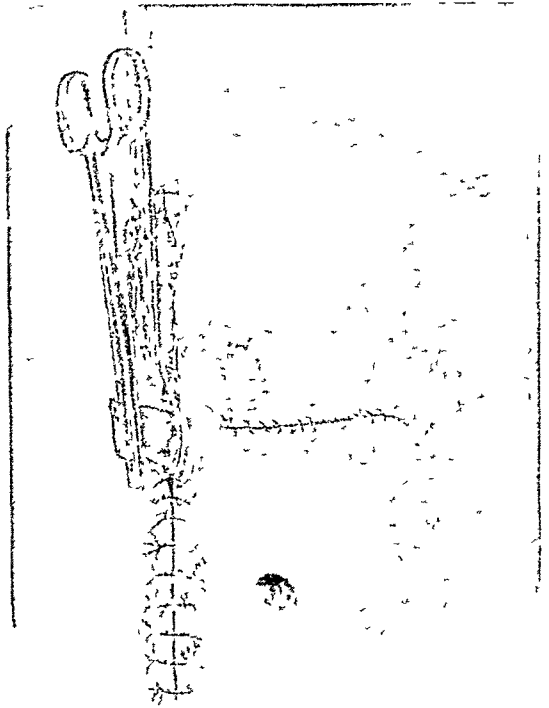


Fig 1 Illustration of simple operative technique

- 1 Resection with lateral, or end-to-end, anastomosis
- 2 Resection with a double enterostomy (Paul, Hartmann, and Mikulicz)
- 3 Reduction of the intussusceptum through an incision into the intussusciens, with or without lateral anastomosis
- 4 Lateral anastomosis about the lesion with secondary resection
- 5 Ileostomy with secondary resection
- 6 Lateral anastomosis about the lesion with secondary healing
- 7 Enterectomy of the base of the invagination, or simple suture after ligation of the mesentery, followed by spontaneous sloughing
- 8 Incision in the bowel wall to permit manual reduction, followed by one of the previously mentioned methods

Statistics from various clinics, as well as individual reports, show the appalling mortality of 70 per cent in a series of 417 cases in which the patients were treated by one of the 8 foregoing operative procedures

The optimal surgical technique should demand the following essentials

- 1 Rapidity of execution

most marked near the ileocecal valve. Severe cramps, nausea, vomiting and constipation are frequent complaints. A mass is almost always palpable at this stage.

The fourth stage is characterized by the development of multiple sinuses and fistulas between various loops of bowel and between the bowel and the outside. These result from slow perforation of the mucosal ulcers. The diseased bowel and its mesentery are enormously thickened and doughy. Walled off abscesses between adjacent loops of bowel are common. Fecal fistulas are frequent and resist all efforts at closure until resection of the diseased bowel is carried out.

The diagnosis of regional ileitis should be considered whenever a young adult complains of symptoms suggestive of partial intestinal obstruction, particularly if there is evidence of an associated low grade inflammatory process. A history of colicky abdominal pain and irregular bowel habits, together with loss of weight, slight fever, leucocytosis and anemia are highly suggestive. The finding of a palpable mass is important additional evidence. In the later stages of the disease x-ray examination reveals a filling defect in the terminal ileum with stasis and distention proximal to it. In cases in which the stenosis is marked the lumen appears as a fine line of barium, the so-called string sign of Kantor.

Treatment depends upon the stage of the disease and the condition of the patient. In the advanced cases surgical extirpation is indicated. The hazards attendant upon radical surgical procedures are peritonitis and sepsis resulting from the activation of latent infection as the result of operative manipulation. In the opinion of the authors, resection of the involved bowel in one or more stages seems at present to be the best form of treatment. When obstructive symptoms, fistulas or abscesses are present, graded procedures such as drainage of the abscess followed by ileocolostomy and subsequent resection, sometimes are advisable. The authors' best results have been obtained in cases in which a one stage ileocecal resection could be performed and the abdomen closed without drainage. They observed no case in which cure was accomplished without resection of the bowel. ARTHUR S. W. TOWNSEND, M.D.

Finkelstein R. Intussusception in the Adult. *Am J Digest Dis* 1938 5 322

Intussusception is essentially an accident occurring most frequently during infancy and early childhood. The recognition of the condition dates back many centuries. As far back as Hippocrates intussusception is on record. Hippocrates suggested treating the obstruction by inflation of the bowel from below. The anatomists of the 16th century are however responsible for the first real description of the condition. The first clinical observations were made during the 18th century, notably by Kuhn in 1702, Velje in 1742, Hevin in 1763 and Hunter in 1789. The latter defined intussusception as the passing of one part of the intestine into the

other and commonly by the upper passing into the lower. This definition, almost one hundred and fifty years old, still holds good today. In 1871 the first record of abdominal section for intussusception appeared by Hutchinson. Since then innumerable cases of intussusception are recorded in the literature, most of them however of children under two years of age. Of 400 cases studied by Perrin and Lindsay 78.5 per cent occurred in children under two years of age and only 4.5 per cent in patients over fourteen years of age. Hinton states that 95 per cent of all acute intussusceptions occur in children, while Sullivan and Dieulafoy concur in the opinion that acute intussusception is almost the only cause of obstruction in infants.

Two other observers, Lutzow and Holm, comment on the fact that intussusception is rare in Norway while it is quite common in England and Denmark. Possibly the extensive use of calomel and castor oil in the latter countries may account for this fact.

Intussusception may be acute or chronic. The acute form is almost always found in children, while the chronic form is the more common in adults. However, intussusception does not occur frequently in adults. Invagination may occur in any portion of the bowel. Usually it is the upper segment that passes into the lower. However, a number of so-called retrograde intussusceptions have been reported. The most common site for retrograde intussusception appears to be the gastro-enterostomy opening, where more or less of the jejunum is invaginated into the stomach. As a rule only a single intussusception occurs, although after reduction it may recur at the same site if not operated upon or at another site.

The direct cause of intussusception is not very well understood. Elliot and Corcoran, in a study of intussusception, found that 33.3 per cent of the cases were caused by tumors within the bowel. Of these tumors 60 per cent were of a benign type, for the most part found in the small intestine, while 40 per cent were of a malignant variety, usually found in the large bowel, especially in the proximal colon. Other causes are Meckel's diverticulum, the appendix, and various forms of intestinal ulcers.

The mechanics of intussusception are discussed by the author. Intussusception consists of the telescoping of one portion of the tube into another. When a malignant tumor or deep ulceration is present, there follows a stiffening of the adjacent intestinal wall and a narrowing of the lumen. When the peristaltic waves approach the area, they are unable to pass through this stiffened segment but carry it forward into the distal bowel. Once an invagination has taken place, peristaltic action pushes the intussuscepted area forward as far as it is attached, mesentery will permit. When a polyp is present the mechanism is somewhat different. Peristaltic waves push the polyp forward as they would any foreign body. Through its attached pedicle the polyp drags along the intestinal wall. Here also when the invagination takes place, further intestinal peristalsis pushes the

Llombart, A. Nerve Lesions in Acute and Chronic Appendicitis (Les lésions nerveuses dans les appendicites aiguës et chroniques) *Ann d'anal path* 1938, 15 605

Llombart reports 10 cases of appendicitis in which pathological study of the appendix showed definite nerve lesions, which the author classifies as follows (1) beginning hyperplasia of nerve tissue, (2) true neuromas, which are further classified as intramucosal neuromas, neuromas located chiefly below the mucosa (submucosal), and neuromas in which the fibers invade all the layers of the wall of the appendix (diffuse neuromas), and (3) neuromas in appendices that are occluded by a cicatrix

In the first group the hyperplasia of the nerve tissue can be explained as due directly to the inflammatory lesions in the mucosa of the appendix. The neuromas present all the characteristics commonly described for these tumors, but with the peculiarity that the cells present are rarely involved in the process. With a silver stain a large number of axis cylinders markedly hypertrophied are demonstrated in these neuromas, but these cannot be demonstrated with other stains. Masson, in his discussion of nerve lesions of the appendix, attributes much importance to the cells of Kultschitzky in the pathogenesis of the hyperplasia of the nerve tissue. The author was able to demonstrate these cells with the silver stain employed as their argyrophil granules stained selectively, they were usually found in their normal location between the cells of the intestinal glands. However, in one patient with a typical intramucosal neuroma, these cells were scattered among the nerve fibers of this tumor. This finding resembles the lesions described by Masson and later by Schak, but the author did not find it to be a constant feature of appendiceal neuroma.

Generally it is difficult to determine the relation of nerve lesions of the appendix to the clinical symptoms. Usually, when the appendix is partially obliterated by a cicatrix, as in 2 of the author's cases, the hyperplasia of the nerve tissue is preceded by an acute attack of appendicitis, with fever and muscular rigidity. It is difficult to determine how much the nerve lesions affect the subsequent clinical picture, which is always characterized by pain, but it seems logical to suppose that they may be the cause of the pain.

The nerve lesions in the appendix evidently develop rapidly, as shown by one of the author's cases in which beginning hyperplasia of the nerve tissue was evident when the patient was operated upon eight days after the initial attack, it is possible that such a nerve lesion represents the primary lesion which induces the attack. In cases in which operation is not performed until months or years after the initial attack, it is impossible to deny or to prove that the nerve lesion was the cause of the attack. It is also impossible to decide whether recurrent attacks favor the development of the nerve lesions, or whether the recurrence is a consequence of the lesions.

ALICE M MEYERS

Bizard, G, Driessens, J, and Malatray, H. Sarcoma of the Ileocecal Appendix (Le sarcome de l'appendice iléo-caecal) *Rev de chir*, Par, 1938, 57 195

Bizard, Driessens, and Malatray state that while a number of cases of cancer of the appendix have been reported, sarcoma of the appendix is of rare occurrence, they have found but 21 cases reported in the literature, and report 1 case of their own, with a summary of the other 21 cases.

In their case the patient was a man twenty-seven years of age, with a large tumor in the right iliac fossa which had grown rapidly in the last eleven months. The tumor had never caused pain or any symptoms other than a slight constipation and some dysuria. Clinical and roentgenological examination indicated that the tumor did not involve the intestines but apparently originated in the mesentery. At operation, however, it was found to occupy the position of the appendix, arising from the cecum, exactly where the appendix is normally found. It was removed, and the pathological examination showed a lymphoblastic sarcoma, without definite signs of a vestigial appendiceal lumen. When the patient was seen three years later there were no signs of recurrence.

In the 22 cases reported, the lymphoblastic type of sarcoma was most frequently observed, in 72 per cent, fibroblastic sarcoma was found in 13 per cent.

In 90 per cent of the cases, the patient noted the presence of the tumor in the right flank, it was usually not as large as in the case reported by the authors. Pain was generally associated with the tumor, which tended to localize at McBurney's point. The authors' patient was the only one who was entirely free from abdominal pain. There were often some digestive disturbances and in some cases a rapid loss of weight. In a few cases, the development of the tumor was insidious, and either symptoms of acute or subacute appendicitis, or symptoms of acute intestinal obstruction brought the patient to the surgeon.

It is very difficult to make the differential diagnosis of a tumor of the appendix, especially to distinguish such tumors from tumors of the mesentery. The diagnosis of sarcoma of the appendix can be made only by histological examination.

Treatment of a tumor of the appendix is necessarily surgical, it may consist in simple removal of the appendix, when the tumor has not invaded any part of the intestines other than the appendix, this operation was successfully done in the authors' case. In other cases a right hemicolectomy must be done with an ileocolic anastomosis.

In the small series of cases of sarcoma of the appendix reported, there were 2 in which the condition was found at autopsy, in 5 cases, the patients were not followed up after their discharge from the hospital. In 50 per cent of the remaining cases, the operation gave good results without recurrence for from one to four years. One patient died a few hours after the operation, 3 patients died in less than a

- 2 Complete removal of the gangrenous bowel
- 3 Control of the concomitant intestinal obstruction
- 4 Control of fluid loss
- 5 Restoration of the continuity of the intestinal canal

Among 76 cases of intussusception in infants two years of age and under in the surgical service of the Johns Hopkins Hospital Baltimore there have been 6 resections. In all but one resection of the ileum with end to end anastomosis followed by double enterostomy was the procedure of choice. Of the 6 patients 3 died the mortality was therefore 50 per cent.

In this paper the writer records his experience with the Mikulicz type of resection in 2 recent successful resections. The surgical principle of exteriorization of the bowel with immediate resection and formation of an abdominal fecal opening was established by the work of Mikulicz Paul and Hartmann. Restoration of continuity to the lumen of the bowel depends upon obliteration of the spur resulting from the formation of the gunbarrel or double enterostomy and at times this obliteration may offer some difficulty. The writer's modification of the Mikulicz operation consists in immediate closure of the bowel ends and the addition of lateral anastomosis. Possible absorption from a side tracked intussusception or from bowel left on the abdominal wall is eliminated by primary removal of the involved intestine. In the 2 most recent successful resections the usual Mikulicz procedure was modified by the addition of a lateral anastomosis. This technical modification is distinctly valuable in the control of the resultant intestinal obstruction and fluid loss.

JOHN W. NOZUM, M.D.

Casini, A. A Case of Carcinoma of the Small Intestine with Extension to the Abdominal Wall (Su di un caso di carcinoma del tenue diffuso alla parete addominale). *Policlinico* Rome 938 45 settembre 21.

Casini states that among the tumors of the digestive tract carcinoma of the small intestine is encountered very rarely. It is difficult to establish the diagnosis of this condition and the anatomicomicroscopic features are often confusing and do not permit a clean cut differentiation from a sarcoma or a tuberculoma.

The male sex is predominantly affected and the condition most commonly occurs in individuals between forty and seventy years of age. The tumor usually occurs in the distal portion of the small intestine and for this reason Kummer and others bring it etiologically into relation with a pathological insertion of the omphalomesenteric duct. Other causative factors which have been considered are trauma and the presence of scar tissue resulting from any pathological process.

Carcinoma of the small intestine occurs in order of decreasing frequency in the lower third, middle third and upper third of this portion of the digestive tract.

Externally the tumor appears in the form of an annular tumefaction tending to constrict the involved intestinal loop. It is of wood like consistency and in advanced cases the stenosis which it causes is so extreme that it causes complete obstruction. Upon section the tumor appears to involve all the layers of the intestinal wall. Metastases are very frequent and are found especially in the liver, ovaries and kidneys and in 1 case in the anterior wall of the rectum with perforation of the urinary bladder. Diffuse forms of the tumor have also been observed. Histologically it is noted that the neoplastic tissue appears to be made up of cylindrical epithelial cells originating from the glands of Lieberkuehn.

Symptomatically the disease begins in aidious and the patient complains of various symptoms which are hard to interpret. Usually a sudden intestinal obstruction permits the physician to make the correct diagnosis. The pain is usually localized at the site of the tumor and is accentuated upon pressure. The patient's condition becomes rapidly worse because of secondary loss of weight, anemia and anorexia. Upon physical examination peristaltic waves can often be seen on the surface.

The condition is usually complicated by hypochlorhydria and by a retardation of the emptying time of the stomach. Roentgenological examination proves of value only in the presence of an intestinal stenosis.

The most frequent complication is intestinal obstruction. The disease usually runs a course of from six months to three years. Survival after three years is rare and the disease is invariably fatal. The diagnosis is always difficult and should be based on the history, the presence of occult blood in the stools, the progressive loss of weight, asthenia and the evidence of obstruction along the course of the small intestine. The condition should be differentiated from: (1) simple stenosis of the small intestine following peptic ulcer and lues; (2) tuberculosis of the small intestine; (3) benign tumors; and (4) connective tissue tumors of the small intestine which occur most frequently.

The prognosis is always grave in conservatively as well as surgically treated cases. Treatment consists in a resection of the involved segment of the intestine with removal of all the involved mesenteric lymph glands. Roentgen and radium therapy do not yield encouraging results.

The author reports the case of a forty year-old woman upon whom a hysterectomy had originally been performed for uterine fibroids. Following the operation the patient developed a carcinoma of the small intestine with extension of the neoplastic process into the abdominal wall. Following resection of the involved intestinal segment she died as the result of an intercurrent bronchopneumonia. Casini believes that the extension of the tumor into the abdominal wall occurred as a result of the adhesion of the tumor to the first laparotomy scar.

RICHARD F. SOMMA, M.D.

cific as might be desired, as it is positive in certain infectious diseases

General considerations Various types of liver injury are followed in many instances by ulcerations of the duodenum which are chronic and have many of the characteristics of "peptic" ulcer in human beings. Our understanding of other functions of the liver, such as protein metabolism, vitamin storage, relation to mineral balance, and pigment metabolism, has undergone many advances in recent years, but few clear cut clinical applications have been developed. The bilirubin clearance is perhaps the most sensitive test, although it is valueless in the presence of jaundice. If the hippuric-acid test is definitely positive or if the venous-stasis bleeding time is much prolonged, or if other tests show impairment of liver function, the increased surgical risk must be taken into consideration.

MANUEL E. LICHTENSTEIN, M.D.

Pendergrass, E. P., and Chamberlin, G. W. Roentgen Diagnosis of Surgical Diseases of the Liver and Biliary Tract. *Surgery*, 1938, 3: 840.

Roentgen examination may be valuable in the demonstration of many lesions involving the liver. It may show (1) variations in density, such as calcification, gas shadows, fluid levels, opaque media, and (2) variations in size, shape, or position of the liver itself, or of its neighboring organs, visualized with or without opaque media.

Calcification in the liver is not common. When present, it is seen more often in centrally necrosed lobules, but it has been observed in Glisson's capsule, in cases of nephritis. It may occur as a result of small abscesses, thrombosis associated with cavernous angiomas of the liver, and perihepatitis. Occasionally, if roentgenograms are made of patients in the erect posture, air and fluid levels in the liver can be shown, they indicate abscess or cyst. The roentgen criteria of liver abscess are elevation of the diaphragm, restriction of motion of the diaphragm, and a more or less hazy increase in density involving the lower right lung field (Figs. 1 and 2). An abscess of the left lobe of the liver is less likely to affect the diaphragm.

Thorium dioxide sol has been used in the demonstration of diseases of the liver. When injected intravenously, it causes increased density of the liver and spleen. Hepatosplenography has been utilized as follows: (1) to determine the nature of a mass in the upper part of the abdomen, (2) to determine the presence and kind of hepatic disease: atrophic cirrhosis, hypertrophic cirrhosis, syphilis, metastatic malignancy, primary tumor, abscess, cyst, or amyloidosis, (3) to ascertain whether metastatic lesions are present in the liver, if operation for carcinoma is contemplated, (4) to demonstrate rupture of the liver or spleen, (5) to determine the cause of jaundice—whether it is intrahepatic or is due to obstruction of the common bile duct, (6) to follow the progress of hepatic or splenic disease, (7) to demonstrate whether a lesion is above or below the diaphragm,



Fig. 1. Liver abscess. The right diaphragm is not elevated but shows some restriction of motion.

(8) to diagnose ascites, and (9) to study diseases of the spleen.

The normal liver is not a fixed organ but, within certain limits, it is freely movable in the abdominal cavity. Buerger has observed 10 cases of partial dystopia of the liver, in which there was an interposition of portions of the intestinal tract between the liver and the diaphragm, or lateral abdominal wall. Distention of these loops by gas may cause pain which may radiate to the back and to the right shoulder. Complete *situs transversus* is not difficult of diagnosis. Riedel's lobe may be readily demonstrable in the properly exposed roentgenogram, while anomalies in size of the liver may occur as a diminution in the right or left lobe, or as an increase in the size of any of the four lobes.

The nomenclature and interpretation of roentgenograms of the gall bladder following the administration of dye is as follows:

A. Functioning gall bladder. This includes gall bladders which showed good concentration of the dye and good emptying after the fatty meal. Subclassification is based on the presence of stones, mural growth, adhesions, or anomalies.

B. Partially functioning gall bladder. In this type there is inadequate concentration of the dye or inability to empty properly. Subclassification is based on the presence of stones or anomalies.

C. Abnormally functioning gall bladder. These gall bladders are poorly visualized, or not visualized.

year of unknown causes. In 2 cases there were recurrences after four and eight months respectively one of these patients died the other was re operated upon and was not traced after the second operation 2 patients died from metastases. Considering that sarcoma of the appendix is a malignant tumor which is rarely diagnosed in the early stages the results of surgical treatment may be considered good.

ALICE M MEYERS

LIVER GALL BLADDER PANCREAS AND SPLEEN

Crandall L A Jr and Ivy A C Applied Physiology of the Liver Surgery 1938 3 815

In spite of the many advances made in studies of the functions of the liver this organ still remains one of the least developed frontiers of medicine. When the liver is removed surgically death ensues within about twelve hours unless glucose be given to maintain the blood sugar level. Even so death can not be postponed more than from twenty four to thirty six hours at the most. The cause of the fatal termination which then occurs is unknown. This is true of no other organ in the body as in every other instance either the cause of death is known or replacement therapy is effective. The large factor of safety (some 80 per cent of the organ may be removed without apparent change) the diversity of functions and the difficulties of experimental investigation and especially of clinical study serve to complicate a study of the functions of the liver and even more seriously disturb an evaluation of the state of those functions by arbitrary tests.

The secretion of bile. It appears that the liver is the sole site of bile salt formation that it plays the major role in the destruction of bile salts and that liver poisons such as chloroform and carbon tetrachloride can produce such a marked decrease in bile salt formation that only traces are present in the bile. Since a sufficient bile salt concentration is essential to keep in solution fatty acids and cholesterol there is a possibility that a decrease in bile salts due either to impairment of liver function or increased bile salt absorption through the wall of a damaged gall bladder may favor the precipitation of gall stones. At the present time no definite decision can be reached concerning the relative importance of pH stagnation decreased concentration of bile salts and other possible factors in human cholelithiasis.

The value of bile for the digestive tract lies in its bile salt content. It would seem more beneficial to administer bile salts by mouth in the maximum dosage tolerated than to return drainage bile in which the bile salt concentration may be negligible. Bile aid in the hydrolysis of fats by lipase and is essential for normal absorption of the fatty acids. Exclusion of bile from the intestine may be expected to result in decreased fat absorption and possible deficiencies of Vitamins A and D. In the presence of a biliary fistula there may develop osteoporosis

which may be secondary to Vitamin D deficiency.

Carbohydrate metabolism. The liver regulates the blood sugar level and its efficiency is dependent to a degree on adequate glycogen storage. The hypoglycemia that accompany adrenal and pituitary insufficiency in all probability are due to failure of the liver to liberate glucose into the blood at the normal rate. The liver converts non sugars such as lactic acid amino acids and glycerol into glycogen or glucose for the maintenance of the glucose supply of the body. Patients with hepatic disease require increased amounts of sugars in the diet best given in the form of glucose not only to promote the storage of glycogen but also to meet the normal glucose requirement of the body since the liver becomes incapable of a normal production of this sugar from non carbohydrate sources. Liver regeneration is most rapid on those diets which permit the greatest deposition of glycogen.

Lipid Metabolism. A loss of fat from the subcutaneous tissues giving a loss of skin turgor and a wasted appearance that may be mistaken for dehydration is often seen in the cases of cirrhosis in which hepatic function seems to be gravely disturbed. The loss of depot fat however remains unexplained. Extensive deposition of liver fat may occur after the administration of hepatotoxins such as chloroform in the absence of the external secretion of the pancreas and when the choline and betaine content of the diet is minimal. Since extensive fat accumulation in the liver depresses hepatic function choline or betaine may be found clinically useful especially in cases in which liver lipid deposits are believed to have resulted from pancreatic fibrosis with lack of external pancreatic secretion. The liver is the site of ketone body formation. Hypophysectomy diminishes or abolishes ketone body excretion as it does the glycosuria in experimental diabetes. On this basis an attempt has been made to treat human diabetes by subjecting the pituitary gland to deep x ray therapy. Such a procedure seems unjustified for while removal of the hypophysis may suppress the ketogenesis and glycosuria of experimental diabetes it does so only by superimposing a second metabolic abnormality upon that already existing.

Relation to blood formation. The liver stores substances which are essential for the normal formation of the red cell stroma hemoglobin and iron. It plays a large part in the formation of the blood proteins especially fibrinogen and albumin and is concerned in the production of those substances other than fibrinogen that are essential for the clotting mechanism. It is important for the regulation of the circulating blood volume and the prevention of excessive dilution after fluid administration.

The inability of the diseased liver to form blood proteins normally especially the decreased formation of albumin which results in a disturbance of the albumin globulin ratio seems to be the basis of the Takata Ara reaction which was first used empirically. Unfortunately the Takata Ara test is not as specific

normal gall bladders In 1924, Blalock concluded that his findings justified the belief that the gall bladder should be removed in all cases in which it was diseased, regardless of the presence or absence of stones The question of the type of operation, cholecystectomy or cholecystostomy, seems to have been settled in favor of cholecystectomy One may conclude, from the opinions of various writers, that the indications and the time to operate have not been settled by any definite criteria

Pathologists do not agree on what constitutes a normal gall bladder It has been estimated that from 30 to 50 per cent of the adult population over thirty years of age have chronic cholecystitis This appears to be the foundation for the statement that most digestive disturbances are due to chronic gall-bladder disease Autopsy records confirm the fact that many patients with gall-bladder disease never have symptoms

From a study of 346 uncomplicated cases of chronic non-calculous cholecystitis, the average age of females operated upon was found to be forty-one and fifty-five hundredths years, while the average age of the males was thirty-nine and sixty-six hundredths years The ratio of females to males was 2.84 to 1 The majority of patients came to operation between the ages of twenty and sixty years, and the most common symptoms consisted of upper abdominal pain, nausea, vomiting, flatulence, constipation, and pain radiating to the right shoulder or to the back The white blood-cell counts in non-calculous chronic cholecystitis averaged 8,170 The most common manifestations of disease outside of the gall bladder were pericholecystic adhesions (57.5 per cent) and hepatitis (17.3 per cent) The mortality rate for 320 cholecystectomies was 2.8 per cent Cholecystostomy was performed in the cases of 26 patients and there were no fatalities Follow-up results showed 34.6 per cent of the patients to be cured, 11 per cent benefited (Grade 1), 15.3 per cent benefited (Grade 2), and 23 per cent to have had no relief

Of 257 patients in whom cholecystectomy was performed, 39.6 per cent were cured, 17.3 per cent benefited (Grade 1), 13.8 per cent benefited (Grade 2), and 25 per cent had had no relief

The greatest number of cures and beneficial results was noted in patients with adhesions about the gall bladder (pericholecystic disease) Roentgenographically the greatest number of satisfactory results were noted in the patients with delayed function From the standpoint of symptoms, 73 per cent of the patients with upper abdominal pain or distress were cured or benefited

A comparison of the results of this study with those in the literature shows that in this branch of gall-bladder surgery, from 1911 to the present time, there has not been any marked degree of progress The conclusion is reached that patients with chronic non-calculous gall-bladder disease should not be subjected to surgery until a complete differential diagnosis is made, and only after a period of rigid medical therapy

JOHN W. NUZUM, M.D.

Cole, W. H. Non-Calculous Cholecystitis *Surgery*, 1938, 3 824

The results following removal or drainage of the gall bladder that is free from stones are so unsatisfactory that serious effort should be made to discriminate more closely as to when operation should be advised There is a large group of patients suffering from non-calculous disease who are relieved by cholecystectomy They must be differentiated from those whose symptoms, while similar, have their origin in the colon, spine, duodenum, or other adjacent organs

The types of non-calculous lesions of the gall bladder capable of producing symptoms can be divided into 6 groups

1 Acute inflammation About 10 per cent of the patients with acute cholecystitis have no stones in their gall bladders The actual mechanics of the production of the acute inflammation are no doubt different in calculous and non-calculous cholecystitis, but the pathological and clinical results may be quite identical In approximately 50 per cent of the cases of acute inflammation positive cultures are found on bacteriological examination Non-bacterial inflammation therefore accounts for a large percentage of cases Andrews has noted that acute cholecystitis can be produced experimentally by injecting bile into the gall bladder "in concentrations only one or two per cent more than the six or eight that are found in normal human bile" Patients with non-calculous acute cholecystitis appear sicker, more frequently have chills, and maintain a higher temperature range than those with acute cholecystitis caused by stones in the cystic duct

2 Chronic inflammation In the majority of instances chronic non-calculous cholecystitis, as characterized primarily by thickening of the gall-bladder wall and lymphocytic infiltration, does not arise as a sequel of acute inflammation but develops insidiously In either the chemical or bacterial chronic cholecystitis the wall may be so badly damaged as to destroy practically entirely the function of the gall bladder It has been shown by numerous observers that the secretory pressure of the pancreas is greater than that of the liver In the human being any obstruction at the sphincter of Oddi distal to the junction of the choledochus and the duct of Wirsung, regardless of whether it is produced by stone or spasm, might allow the entrance of pancreatic secretion into the common duct and gall bladder with the subsequent production of cholecystitis The actual importance of non-calculous cholecystitis lies in the observation that, in general, cholesterol stones are produced by short periods of obstruction at the cystic duct and calcium stones are produced by long periods of obstruction The primary factor under these circumstances would have to be non-calculous in origin

3 Lesions of the cystic duct Obstruction to the cystic duct may be unmistakable and may even be so severe as to produce a complete obstruction The 3 patients described by the author appear to illus-



Fig 2 Liver abscess. Same patient as shown in Fig 1 a few days later following rupture of the liver abscess. Right dome now elevated and fixed. There is a lung reaction in the right lower lobe.

at all or they increase in size during the examination and reflux is indicated. Subclassification is based on the presence of opaque or non-opaque stones, milk of calcium bile, calcified gall bladder and anomalies.

The most common opaque shadows in the right upper abdomen which may be confused with gall stones are renal calculi, calcified glands or vessels, barium in diverticula of the colon (calcification in the liver or pancreas) and calcification of a tuberculous abscess. Repeated examinations in various postures are frequently necessary for proper interpretation. Pyelography may be necessary to exclude renal pathology.

Milk of calcium is chiefly calcium carbonate in the gall bladder. The roentgenogram shows a dense gall bladder shadow. The organ itself is sometimes brimful and does not empty after the fatty meal (Fig 3). Tumors may be suspected upon the finding of one (or more) clear oval or circular defect which remains constant with changes in the position of the patient.

Anomalies of the shape and position of the gall bladder are detected by cholecystography.

The demonstration of stones in the common duct during operation by the injection of an opaque medium with immediate x-ray examination is a recent accomplishment. Delayed examination of the com-



Fig 3 Milk of calcium bile and non-opaque gall stones. There is no change in the size or shape after the fatty meal. Puttylike material mixed with cholesterol stones was found at operation.

mon duct by the injection of a radioopaque substance through a T tube is of value in the determination of the condition of the common duct.

MANUEL E. LICHTENSTEIN, M.D.

Brown, M. J. Non-Calculous Chronic Gall Bladder Disease. *Am J Surg* 1938, 41, 238.

Many medical writers have attested to the unsatisfactory results of surgery on the non-calculous chronic gall bladder. The author's paper is an attempt to analyze the data derived from a clinical and follow-up study of 346 uncomplicated cases of chronic non-calculous cholecystitis. The physiology of the gall bladder in its modern conception and the principles of cholecystography are reviewed. The conclusion is drawn that the Craham-Cole test measures gall bladder physiology and not the extent or the character of the pathological lesion which is present. The test should not be accepted as the final diagnostic aid in chronic non-calculous cholecystitis.

In 1909, Moynihan called attention to the strawberry type of gall bladder. Cholecystectomy has been accepted as the operation of choice in this type of gall bladder disease. The question as to when the gall bladder should be removed remains unsettled. Prior to 1910, changes and enlargement of the liver had been observed in non-calculous gall bladder disease by many writers. Craham proved that hepatitis was a rather constant accompaniment of chronic cholecystitis. Alvarez and his coworkers admonished that surgeons who became enthusiastic over the results of early cholecystectomy should check up on their work in order to avoid the danger of removing

ease surviving for from five weeks to five years. The patients who died in the early weeks after the operation (2 after four weeks, and 1 after five weeks) died from a cholemic secondary hemorrhage also. The patients with benign basic diseases are all still alive in good health, even though in these the icterus had existed up to nine weeks also. In the follow-up studies of this group of the detour operations the author could find only 2 patients who suffered from cholangitis, although in some of the remaining cases a filling of the gall bladder and of the biliary passages with contrast medium appeared roentgenologically. The author did not encounter uncontrollable vomiting as a result of the induction of the bile into the stomach.

Of the 8 patients in the second group, 2 died a short time after the operation, 1 from a cholemic hemorrhage and the other from cardiac weakness. The remaining 6 survived, the prolongation of life in 1 with a malignant basic disease amounting to two and one-half years, whereas in those with benign basic diseases the prolongation of life has been twelve years and they are still living. In this group the author was able to observe 2 cases of cholangitis, but there were cholemic attacks even before the operation. In the 1 case of choledochogastrostomy a prolongation of life of one year was achieved, death being due to cancerous cachexia, while the patient on whom choledochoduodenostomy was done died five days after the operation from cardiac weakness.

According to the reports in the literature, which are concerned mainly with choleduodenostomy, this method must be considered as the most useful and it is given preference by a number of investigators. The immediate results are very good and the ultimate results are satisfactory also, even though, as is self-understood, they depend upon the basic disease, which is decisive for the subsequent duration of life. According to Heller and to Bernhard, the results of cholecystoduodenostomy and cholecystogastrostomy do not vary essentially, so that both of these procedures should be considered of equal value, an observation which the author believes he can confirm on the basis of his own little material. There is no uniformity of opinion in the literature on the question of the occurrence of cholangitis. The only certainty is that the development of cholangitis occurs more often following an anastomosis between the hepatic duct and the gastrointestinal canal than with the use of the lower biliary tract and the gall bladder. From the reports in the literature and according to the author's own investigations, the conclusion that the detour operations in occlusion of the biliary tract give good results both immediately and for a prolonged time is justified. With this method, both the pains and symptoms of the patient, as well as the cholemia, may be overcome and a considerable prolongation of life, even in the presence of a malignant basic disease, may be achieved. The patient recovers his enjoyment of life and in a proportion of cases again

becomes able to work. Consequently, the use of such detour operations can be recommended as being successful in cases of complete occlusion of the biliary tract that can be relieved in no other way. Three tabulations show the results.

(WAGNER) LOUIS NEUWELT, M D

Lahey, F H, and MacKinnon, D C. Carcinoma of the Pancreas. *Surg Clin North Am*, 1938, 18, 695

Carcinoma of the pancreas is not a common form of malignant disease. It constitutes only from 1 to 2 per cent of all carcinomas. In the management of this disease, difficult problems of diagnosis and treatment are encountered.

This analysis includes 47 cases of carcinoma of the pancreas in which operation was performed at the Lahey Clinic in Boston, with a follow-up note on all patients until the time of death. In 35 cases the diagnosis was made from a satisfactory operative description of the gross pathological change as observed by an experienced surgeon. Seven of the remaining cases were proved to be carcinoma of the pancreas at biopsy, and 5 at autopsy.

The average age of these patients was fifty-six years, the ages ranging from thirty-one to eighty years. There were 23 men and 24 women, a higher incidence of women than is usually found in most reports.

The average duration of the disease before admission to the clinic was three and six-tenths months, this period ranging from one to nine months. Pain frequently preceded the onset of jaundice. In the order of their frequency, the most common symptoms of carcinoma of the pancreas were weight loss, anorexia, pain, jaundice, nausea, and vomiting. Loss of weight was present in 85.1 per cent of the cases. There were practically no disturbances of the bowel function.

On physical examination, abdominal tenderness was elicited in 36.1 per cent of the patients, it occurred in the epigastrium in 5, and in the right upper quadrant in 12. There was no relationship between tenderness in the right upper quadrant and the presence of distention of the gall bladder. An abdominal mass was palpable in 55.3 per cent of the cases, it was found in the right upper quadrant in 18, in the epigastrium in 5, and in the right upper quadrant and epigastrium in 3.

The roentgenographic findings of extrinsic pressure on the stomach or duodenum, duodenal stasis, or widening of the duodenal loop are valuable diagnostic data. Roentgenograms were taken in 21 cases, 6 were negative, 7 showed extrinsic pressure or stasis with no widening of the duodenal loop, and 8 showed widening of the duodenal loop without extrinsic pressure or stasis. Therefore, positive roentgenological findings were noted in 71.4 per cent of the cases in which gastro-intestinal roentgenograms were taken. Such a valuable diagnostic aid should be used more frequently when carcinoma of the pancreas is suspected.

trate 3 of the important types of obstruction viz angulation of the duct stenosis and anomalous excessive Heisterian folds. While no positive proof can be offered that lesions of the cystic duct as described in these 3 patients were the primary cause of the patients' complaints nevertheless the wall of each gall bladder was so slightly diseased and the common duct appeared so normal that the author believes himself justified in ascribing the cystic duct of being the major factor in the production of the symptoms.

4 Biliary dyskinesia. Under normal circumstances the secretory pressure of bile in the liver which varies between 300 and 600 mm of water is far higher than the pressure of 100 mm of water necessary to break through the sphincter of Oddi. Occasional instances have been reported in which sufficient spasm of the sphincter of Oddi has been noted postoperatively to produce symptoms and to require a pressure of 100 mm of water to break through it. In such instances the pain complained of is similar or identical to that noted before operation. Nitroglycerin (glyceryl trinitrate) relieves the pain produced by this spasm. The pressure within the common duct from 0 to from 200 to 350 mm of water as produced by the hypodermic injection of morphine may at times be associated with pain in the upper abdomen. This pain and discomfort is not unlike that experienced by many patients with supposed gall bladder disease. Although it appears that the paralysis of the sphincter of Oddi as noted after cholecystectomy is usually permanent in instances have been reported in which a paralysis of the sphincter of Oddi was noted postoperatively. It is apparent that this spasm may be responsible for the patient's symptoms and failure to obtain relief. It is barely possible that in many instances relief of symptoms following operation is dependent upon a paralysis of the sphincter of Oddi. It appears that this group of patients who have persistent symptoms following cholecystectomy and in whom spasm of the sphincter is demonstrable may be classified as belonging to the group of patients with biliary dyskinesia.

5 Metabolic disturbances in the biliary system. It seems likely that most of the pathological metabolic findings are of importance chiefly in relation to the ultimate production of stones or to the depositions of calcium in the wall of the gall bladder. The change in the bile acid cholesterol ratio in the etiology of cholesterol stones has been emphasized.

6 Cholesterosis. There is a growing disbelief in the relationship between cholesterosis and symptoms of gall bladder disease. Gall stones will be found to accompany cholesterosis in from one third to one half of the occasions on which it is noted at the operating table. It is particularly noteworthy that excision of the gall bladder in the presence of cholesterosis without stones is followed by poor results. It is therefore doubtful if cholesterosis has anything to do with the production of manifestations attributable to disease of the gall bladder.

It appears logical to assume that no single factor is responsible for cholecystitis. Many factors including acute and chronic infection of the gall bladder, chemical inflammation, obstruction of the cystic duct, biliary dyskinesia, and perhaps others are important in the pathogenesis of gall bladder disease.

MANUEL E. LACHRY, M.D.

Wagner W. The Results of Detour Operations in Occlusion of the Biliary Tract (Fig. 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000).

Detour operations on the biliary passages are necessary in cases in which complete occlusion of the biliary tract has resulted from pathological changes and cannot be corrected. The cause of such biliary tract occlusions may vary and may be due to congenital atresia of the biliary passages, valve formation in the common bile duct with the formation of the so-called idiopathic choledochus cyst, stenosis of the biliary passages as a result of inflammation or traumatic changes or compression of the biliary passages from without by metastatic or tuberculous glands or inflammatory processes in the head of the pancreas. In these disease conditions detour operations have stood the test of time. In recent years an attempt at extension of the indication for these operations has even been made inasmuch as they have been recommended for multiple calculus formations in the biliary passages and in the presence of cholangitis. However these latter indications are not generally recognized as yet. Up to the present time there are relatively few reports on the results of such detour operations.

The author made a follow-up study of 36 such operations which included 26 cases of cholecystogastrostomy, 8 cases of cholecystoduodenostomy, 1 case of choledochoduodenostomy and 1 case of choledochogastrostomy. In 14 of the 26 cases of the first group a carcinoma of the head of the pancreas was present in 5 a carcinoma of the papilla and common bile duct and in 1 glandular metastases from a carcinoma of the tongue. The remaining 6 cases were caused by benign compressions and stenoses. Three of the 8 cases in the second group were caused by a carcinoma of the head of the pancreas and the common bile duct and of the papilla and the remaining 5 by benign compressions and stenoses. The third and fourth groups presented a carcinoma of the head of the pancreas as the cause.

The results of the detour operations (cholecystogastrostomy) in the first group were the following:

Of the 26 cases 5 had a primary mortality within the first six days, the cause of death being a cholemic secondary hemorrhage. The icterus in these fatal cases existed for from four to twelve weeks before the operation. The biliary disease was a carcinoma in 3 cases and a mechanical icterus in 2. The cause of the icterus was not disclosed even at autopsy. In the remaining 21 cases the patients withstood the operation and lived for various periods of time, those with a malignant basic dis-

retroperitoneal hemorrhages and infiltrations show roentgenographic symptoms similar to those of paranephritis

The author shows the diagnostic value of roentgenography in 30 cases of subcutaneous abdominal injuries, including mainly ruptures of the kidney, liver, spleen, or intestine, and also abdominal contusions with renal hemorrhage and other internal injuries. With subcutaneous abdominal injuries the life-threatening hemorrhage or beginning peritonitis demand early diagnosis and surgical intervention, as in the presence of these complications the prognosis becomes worse with every hour of delay. Unfortunately, the early diagnosis is seriously hampered by shock, which may last three hours. Often the patient is seen only after the shock has passed. If the symptoms of internal hemorrhage or peritonitis are then pronounced, the operation is usually done without previous roentgenography. This is also done when the complications are evident in spite of existing shock. Many surgeons claim that operations should be avoided during shock when the diagnosis is uncertain, and should be done after the shock has worn off, when hemorrhage or peritonitis is present. Others believe that an exploratory operation, whether shock is present or not, should be done as soon as there is the slightest suspicion of these complications. This viewpoint is based not only upon the experience that an exploratory laparotomy is a relatively harmless intervention and that the prognosis is much better with early operation, but also upon the fact that the clinical signs of free fluid or free gas in the abdomen following rupture or perforation often appear relatively late and even then may be quite uncertain. They often become positive only after the free gas or fluid is abundant.

Following the rupture of abdominal viscera, the contents and blood often enter the free abdominal cavity. The free fluid also increases from the inflammation and exudation of the peritoneum caused by the contents of the digestive tract, urine, bile, and blood. As free fluid in the abdomen is an early and important symptom of visceral injury, but often is clinically demonstrable only late, other diagnostic aids, such as exploratory puncture, have been suggested, but some surgeons object to this because of the danger of intestinal injuries. The clinical symptom of free fluid, displaceable dullness in the loin, may also occur in ileus of the small intestine with fluid in the gut. Here again an exploratory puncture may be dangerous, as well as when the free fluid in the abdomen is present in a small amount or only in certain places.

Hence it must be considered as progress that the presence of free fluid in the abdomen can be demonstrated with the harmless method of roentgenography, especially when the fluid is present in such a small amount that the clinical examination gives only uncertain or negative findings. With beginning peritonitis following perforation of the digestive tract, the clinical picture (muscle defense) is often diagnostically decisive long before the free fluid is

clinically demonstrable. In such cases roentgenography is a valuable aid.

LOUIS NEUWELT, M D

Sergi, V. Abdominal Contusions, with Special Reference to the Stomach and Small Intestine (Sulle contusioni addominali con particolare riguardo a quelle dello stomaco e dell'intestino tenue) *Arch ital di chir*, 1938, 48 449

Sergi states that the mechanisms of abdominal contusions are multiple, the three most common ones being percussion and pressure (direct trauma) and contrecoup (indirect trauma). Abdominal contusion may also be produced by the sudden contraction of the abdominal muscles.

It appears that contusions which are produced directly usually involve the solid abdominal viscera, such as the liver, spleen, and kidneys. In some rare cases, however, also hollow viscera have been involved.

Contusions of the stomach are relatively rare largely because of the fact that this organ is protected by the costal arches. Trauma may occur directly as well as indirectly. The three most common lesions are simple contusions, partial rupture, and complete rupture of the stomach. Simple contusions usually heal uneventfully but in some cases a secondary necrosis followed by perforation of the viscus may occur. In cases in which there is a lesion of the gastric mucosa, a chronic secondary ulcer may develop at the site of the injury, but this type of lesion is rare and if it occurs, it is usually due to the coexistence of certain predisposing factors. This consideration is of considerable medicolegal importance in disputed cases of compensation in which gastric ulcers are etiologically brought into relationship with a pre-existing trauma.

In general, the author believes that a traumatic ulcer arising in a previously healthy gastric mucosa is an exceedingly rare event, and therefore this condition may be considered of little, if any, practical importance. It would be unscientific, however, to deny the theoretical possibility of such a lesion. The presence of a traumatic gastric ulcer can be definitely ascertained only if certain specific conditions are taken into consideration, such as the absence of predisposing factors, a negative history, and all those other elements which are at present believed to be etiologically related to the spontaneous development of a peptic ulcer.

Concerning contusions of the small intestine, the author emphasizes that these lesions involve usually the second and third portions of this intestinal segment. The injury arises often as the result of direct trauma upon the epigastrium. Contusions of the duodenum are of special importance because of their gravity and because of the difficulty involved in diagnosis. Early operative intervention is of utmost importance, the mortality being almost 100 per cent in cases which are treated conservatively.

The same considerations hold true for contusions involving the jejunum and the ileum, except that trauma in these regions may be followed also by a

When the common bile duct is involved additional diagnostic evidence may be obtained by examination and demonstration of the absence of bile or the presence of blood in the duodenal drainage. Duodenal drainage was done in only 7 cases but in all of these cases bile was notably absent and in 2 cases blood was obtained. It must be remembered that carcinoma primary in the bile ducts may give similar findings.

Upon operation there was distention of the gall bladder in 63.9 per cent of the cases. Metastasis occurred locally or to the liver in 31.9 per cent. The primary growth involved the head of the pancreas in 38 cases, the body in 2, the tail in 1, the entire gland in 4, and the stomach, pancreas and transverse mesocolon in 2 cases.

The pain associated with this lesion is however much less severe and persistent than that associated with gall stone colic. Less than two-thirds of the cases showed jaundice and distention of the gall bladder. When these two factors are present they are important diagnostic aids indicating obstruction of the common bile duct but they may never occur or may appear as late manifestations of the disease. Anorexia, progressive weight loss and a dull pain in the epigastrium or right upper quadrant of the abdomen, boring through to the back under the angle of the right scapula are more suggestive symptoms of this disease. Pain is not entirely due to the distention of the gall bladder since there is no definite relationship between these two factors. Weight loss was a frequent symptom definitely associated with anorexia and probably caused by a disturbance of the pancreatic function.

A number of surgical procedures were used in the management of these cases: abdominal exploration, cholecystogastrostomy, cholecystogastrostomy and posterior gastroenterostomy, cholecystoduodenostomy, cholecystojejunostomy, cholecystojejunostomy and choledochostomy, choledochostomy, choledochostomy and cholecystostomy and cholecystostomy and posterior gastroenterostomy.

The average length of life of the 38 patients who survived operation without regard to the method of management was eight and six tenths months.

The pancreas is quite sensitive to radiation. It is distinctly worth while to employ irradiation in these cases after operation as evidenced by the prolongation of life in those in which irradiation was given as compared with those in which irradiation was not used.

The authors have employed three types of palliative operation in patients with malignancy of the head of the pancreas: anastomosis of the gall bladder to the stomach (cholecystogastrostomy), anastomosis of the gall bladder to the duodenum (cholecystoduodenostomy) and anastomosis of the gall bladder to the jejunum (cholecystojejunostomy). Of these procedures only the latter one has now been employed for some years.

Cholecystogastrostomy is an undesirable surgical procedure. The authors have seen the powerful per-

istaltic waves of the stomach so propel the gastric contents out through the new opening that it was forced into all of the smaller bile passages. Another disadvantage of anastomosis of the gall bladder to the stomach is that the wall of the stomach is thick with a loose redundant mucosa which makes the accurate anastomosis of the stretched out thin walled gall bladder to the stomach difficult.

In anastomosis of the gall bladder to the duodenum there are likewise disadvantages in that both structures are relatively fixed therefore the accurate approximation and anastomosis of the gall bladder to the duodenum may be difficult and at times a little uncertain. The gall bladder must migrate to the duodenum since the duodenum cannot be made to migrate to the gall bladder. The rise and fall of the liver with diaphragmatic motion which at times is of quite violent character with vomiting must jeopardize the security of this suture line. Therefore because of the difficulty at times in making this anastomosis and the danger of traction on it the authors have entirely given up this type of operation in cases of carcinoma of the head of the pancreas.

After the anastomosis between the gall bladder and the jejunum with its double row of sutures is completed a silk stitch is placed between the proximal loop of the jejunum and the capsule of the liver close to the anastomosis and a similar one is placed between the distal loop of the jejunum and the capsule of the liver. This so fixes the anastomosed jejunum to the liver that it ascends and descends with any motion in that structure and thus takes all strain off the suture line. This is a most important point when one appreciates that many of the anastomoses must be made with a stretched gall bladder wall of almost paper thinness out of which stitches will tear very easily.

JOSEPH A. KARPAT, MD

MISCELLANEOUS

Ladreit H. The Roentgenographic Symptoms in Abdominal Injuries from Dull Force (Ueber die Roentgen symptome bei Bauchverletzungen durch stumpfe Gewalt). *Upsala Lakref. Forh.* 1938 43: 239.

Roentgenography seems to be used but little as an aid in the determination of the nature of injuries of the viscera due to external dull force directed against the abdomen. The literature mentions mostly only the possibility of confirming the presence of free gas in the abdomen as an expression of perforation of gas containing organs. The diagnostic value of intravenous and retrograde urography in rupture of the renal pelvis and other portions of the urinary tract is also mentioned. It is usually forgotten that free fluid in the abdomen can be demonstrated roentgenographically often much earlier and more definitely than with ordinary clinical examination. This is true also of inflammatory exudate, pus, transudate and hemorrhage. It is also forgotten that

GYNECOLOGY

UTERUS

Wollner, A. The Histological Correlationship of Endometrial and Cervical Biopsies *Am J Obst & Gynec*, 1938, 36 10

A comparative histological study of endometrial and cervical biopsies, taken from normally menstruating women with apparently normal genital organs, revealed identical and synchronous cyclic changes in both structures. The histological effects of the ovarian hormones can be demonstrated as clearly in the mucosa of the uterine cervix as in the endometrium.

In the study of the histological cycle in human beings, the periodic cervical biopsy method offers distinct advantages over the endometrial biopsy procedures. (1) it always is possible to obtain the desired amount of tissue for histological study, (2) the specimens always comprise the entire length of the endocervix, and a comparative study of subsequent biopsies is based on findings of identical structures of the mucous membranes, (3) the site of previous excisions is visible, which makes the selection of intact surfaces possible, (4) the histological interpretation is facilitated by the fact that a compact piece of tissue is obtained, in which the different structural elements are found side by side as they actually exist *in situ*, (5) the periodic cervical biopsy method can be carried out at weekly intervals as an office procedure, without anesthesia, (6) the regularity of menstruation is not affected.

The use of the cervical mucosa as a test object will make possible an intensive study of the sex cycle in the human being. Definite knowledge of a histological cycle in the endocervix is bound to change the interpretations of certain pathological findings in this particular structure. Inflammatory diseases of the cervix are frequently diagnosed.

In the course of periodic cervical studies, all of the supposedly inflammatory pictures were observed at one or another phase of the histological cycle and the author found them to be the characteristic manifestations of the physiological function of this structure. These changes were not of a permanent nature, but were found as different stages in the cyclic transformation of the endocervix. Increased activity of the columnar cells, with mucus production and migrations of the nuclei, is always observed in the secretory phase of the cycle. Exfoliation of the epithelium on the surface and in the glands is physiological shortly before and during menstruation. The heaping up of columnar cells with frequent divisions is present in the proliferative stage. Round-cell infiltration and edema of the stroma with occasional diapedesis occur in the late secretory phase.

The evaluation of an increased amount of discharge from the cervical canal as an expression of

inflammatory involvements also requires revision on the basis of the evidence herein presented.

EDWARD L. CORNELL, M.D.

Schlink, H. H., and Chapman, C. L.: The Early Diagnosis of Cancer of the Cervix *Med J Australia*, 1938, 2 71

It is now well recognized that the earlier the diagnosis of cancer is made, the better the results, no matter what method of treatment is adopted. Public recognition of this fact has resulted in sufferers' reporting at a much earlier stage of the disease than formerly. The authors believe, therefore, that further improvement in results depends upon the medical profession's becoming more proficient in (a) the recognition of the predisposing causes of cancer, and (b) in improvement of their diagnosis of doubtful and early cases.

Listed as predisposing causes are chronically infected lacerated cervixes, endocervical infections, residual cervixes with their restricted blood supply, and the superficial cell changes of the portio vaginalis, such as leukokeratosis, leucoparakeratosis, and leucokeratosis. Also listed as possible precursors of cancer are desquamated patches and small ulcerations which resist appropriate treatment, polypi and papules, endometrial hyperplasias, fibromyomas and endometriomas, syphilitic ulcerations, and myopathic uteri. The authors believe also that uterine cancer is frequently associated with chronic metritic and salpingitic changes.

As an aid in evaluating properly the suspicious conditions of the portio vaginalis of the cervix, the colposcope is heartily endorsed. Correct interpretation of colposcopic findings can be learned only by constant practice, however. Contact bleeding should always be tested under the eye. Biopsies of suspicious areas should always be taken for microscopic examination. The authors are convinced that the surgeon himself should be thoroughly familiar with the microscopic findings.

There then follows a somewhat detailed description of the normal histology of the cervix, and of the changes produced by inflammation. Attention is called to the cellular changes in the cervix due to metaplasia (ordinarily known in the United States as epidermoidization), which the amateur or the not fully trained person often mistakes for early carcinoma. In the fully developed state the columnar epithelium of the glands and the surface appears to have been replaced by squamous epithelium, the glands may be completely filled with cells of this type. However, the cells are uniform in size, shape, and staining qualities, and there is no invasion of the stroma. These changes may progress toward malignancy, in which event the nuclei become hyperchromatic, irregular in size and shape, larger, darker, and more irregularly arranged than in simple meta-

disinsertion of the mesentery This latter lesion is by no means uncommon and to its genesis the individual anatomical and physical makeup of the mesentery is of prime importance adiposity the presence of tumors and inflammatory processes all tend to increase the friability of this portion of the peritoneal sac Obviously a disinsertion of the mesentery carries a very poor prognosis because of the resulting impairment of the blood supply The segment of the intestine almost invariably becomes gangrenous

Sergi made a series of experiments with dogs in which he produced abdominal contusions of various segments of the intestinal tract The results obtained showed that no serious consequences arise from a *prolonged ischemia of the intestinal wall* The gravest consequences result however in the presence of a mechanical disorganization of the various intestinal layers and in the presence of injuries to the blood

vessels In all cases a disinsertion of the mesentery resulted in gangrene of the corresponding intestinal loop The surgical removal of the serous and muscular layers was always endured with impunity even though carried out extensively In no case however did the author observe the formation of an ulcer or of a stenosis

Concerning the symptomatology and the diagnosis of abdominal contusions Sergi states that pain is almost always a constant sign Sometimes the patient is in shock but this sign is by no means typical In later stages the temperature may be of diagnostic importance Vomiting is almost always present The outstanding diagnostic signs are the tenderness on palpation and the rigidity of the abdominal wall *There are several other signs which have been reported by other investigators but none of them is of any definite diagnostic value*

RICHARD E SOMMA M D

Heyman, J.: Annual Report on the Results of Radiotherapy in Cancer of the Uterine Cervix. I Statements of Results Obtained in 1930 and Previous Years League of Nations Health Organization, 1937

In 1938 the Radiological Subcommittee of the Cancer Commission of the Health Committee was invited to report on the possibility of presenting uniform statistical statements on the results obtained by radiotherapeutic methods in the treatment of carcinoma of the cervix. Realizing that uniformity in recording results obtained by different methods was necessary, a committee was appointed to formulate rules designed to accomplish this. The recommendations of this committee were adopted in several countries.

Two main sources of error were noted (1) the smallness of samples, and (2) the lack of comparability of the material from different clinics.

Six rules for the guidance of collaborators in presenting their data are presented. The study includes only carcinoma of the uterine cervix and only those cases treated with radiation alone. The treatment was given by the clinic or individual reporting it. This annual report contains statements from six organizations. The first is from the Centre des Tumeurs de l'Université de Bruxelles, Belgium, for 1930, and applies to 94 patients examined with a view to treatment, of whom 83 received treatment, the remaining 11 were not treated for various reasons. Eighty-one had microscopic verification of the diagrams, 2 did not. There were 9 cases in Stage 1, 27 cases in Stage 2, 35 cases in Stage 3, and 12 cases in Stage 4. At the end of five years, 4 of the 9 patients in Stage 1 were alive without recurrence, 4 had died of carcinoma, and 1 had died from an intercurrent disease. No patients with recurrence were alive. Of the patients in Stage 2, 3 were alive without recurrence, 1 was alive with recurrence, 21 had died from carcinoma, and 2 had died from intercurrent disease. Of the 35 patients in Stage 3, 7 were alive without recurrence, 1 was alive with recurrence, 26 had died from carcinoma, and 1 had died from intercurrent disease. All 12 patients in Stage 4 had died from carcinoma. A résumé shows that 14 of all the 83 patients were alive without recurrence, 2 were alive with recurrence, 63 died of carcinoma, and 4 had died of intercurrent disease. This gave an absolute-cure rate of 14.9 per cent and a relative-cure rate of 16.9 per cent.

A report covering the years 1926 to 1929, inclusive, states that 290 patients were examined with a view to treatment, 38 of them were not treated for various reasons. Of the 252 cases treated 65 were in Stage 1, 57 were in Stage 2, 102 were in Stage 3, and 26 were in Stage 4. At the end of a five-year period 68 of these patients were alive without recurrence, the absolute-cure rate being 23.4 per cent and the relative-cure rate 27 per cent.

The Liverpool Radium Institute, England, reports that in 1930, 92 patients were examined with a view to treatment. Eighty-nine were treated, 1 re-

fused treatment, and 2 were considered unsuitable for treatment on account of their general condition. Of the patients treated, 13 were in Stage 1, 26 were in Stage 2, 29 were in Stage 3, and 21 were in Stage 4. At the end of a five-year period 25 of the total number were alive without recurrence, 58 had died of cancer, 2 could not be found, and 2 had died from intercurrent disease. No absolute-cure rate for this series was given. The relative-cure rate was 28.1 per cent. The statement of this clinic for the year 1929 is as follows:

The number of patients treated was 34. At the end of five years 8 of these were alive without recurrence, 24 had died from cancer, and 2 had been lost sight of. The relative-cure rate for the five-year period was 23.5 per cent.

The Marie Curie Hospital of London reports on 136 patients who were treated in 1930. The total number observed was 142. Six patients were in Stage 1, 32 in Stage 2, 81 in Stage 3, and 17 in Stage 4. At the end of a five-year period, 56 were alive without recurrence, giving an absolute-cure rate of 39.4 per cent and a relative-cure rate of 41.2 per cent. For the years from 1925 to 1929 inclusive, 326 patients were treated, with an absolute-cure rate of 33.5 per cent and a relative-cure rate of 34 per cent.

The Radium Center for Carcinoma of the Uterus, London, England, for the year 1930, reports 57 cases which were treated. Three were in Stage 1, 24 were in Stage 2, 18 were in Stage 3, and 12 were in Stage 4. At the end of the five-year period 10 patients were alive without recurrence, a relative-cure rate of 17.5 per cent and an absolute-cure rate of 15.2 per cent. For the years 1928 and 1929, 93 patients were treated. At the end of five years 14 were alive without recurrence, an absolute-cure rate of 13.5 per cent and a relative-cure rate of 15.1 per cent.

L'Institut du Radium de l'Université de Paris, France, for the year 1930 reports on 111 cases which were treated out of a total of 158. Sixteen were in Stage 1, 34 were in Stage 2, 47 were in Stage 3, and 14 were in Stage 4. No absolute-cure rate was stated. At the end of the five-year period 52 patients were alive without recurrence, a relative-cure rate of 46.8 per cent. In the period from 1919 to 1929 inclusive, 871 patients were treated. Eighty-one were in Stage 1, 328 were in Stage 2, 364 were in Stage 3, and 98 were in Stage 4. At the end of five years' observation, 260 of the patients were alive without recurrence, 30 were alive with recurrence, 547 had died of cancer, 13 could not be found, and 21 had died of intercurrent disease. This gave a relative-cure rate of 29.9 per cent.

The Radiumhemmet of Stockholm, Sweden, for 1930 reported on 108 cases which were treated among a total of 205. Twelve were in Stage 1, 60 were in Stage 2, 93 were in Stage 3, and 33 were in Stage 4. At the end of five years 50 patients were alive without recurrence, 3 were alive with recurrence, 136 had died of cancer, and 4 had died of intercurrent disease. The reported absolute-cure rate for the five-year period was 24.4 per cent and the

plasia. There may still be no invasion however. This the authors term carcinoma *in situ*. The terminology of the group is open to dispute. These changes are described by some as *pre-malignant*.

Finally, the well defined frank cancers are described. These are divided into the anaplastic, the transitional, the fully ripe or squamous and the glandular or adenocarcinoma types. The descriptions are conventional. DANIEL G. MORTON, M.D.

Schlink H. H. and Chapman C. L. The Treatment of Cancer of the Cervix Uteri. *Med J Austalia* 1938 2 74

The treatment used and the results obtained at the Royal Prince Alfred Hospital in Sydney, Australia are reported. The 270 cases reported were seen between 1930 and the end of 1937. Five year results were available in 108 of the 270 cases.

The routine treatment was as follows:

1. A complete history was taken and a physical examination was made. Special records were kept in addition to the official hospital history.

2. The cases were grouped according to the League of Nations Classification after a thorough examination had been made clinically with the colposcope and under anesthesia.

3. A blood count and a Wassermann test were made.

4. A biopsy and diagnostic curettage were performed.

5. Radium was inserted in all cases except in those that were very advanced.

6. All patients were re-examined in five weeks to ascertain their operability.

7. Patients who displayed even slight uterine mobility were submitted to the Wertheim operation. The remainder were reserved for radiotherapy.

The radium application consisted of one large dose. The whole length of the uterine cavity was irradiated with 50 mgm. of radium element screened by 1.5 mm. of platinum in a rubber covered tube. A rubber covered cork containing 20 mgm. of radium element screened by 2 mm. of platinum was placed in each lateral vaginal fornix. In the cases for which five year results are reported the dose was 5,000 mgmh. Recently the dose has been increased to between 6,000 and 7,000 mgmh.

The radium usually reduced the size of the growth and helped make inflammatory induration disappear. Thus many borderline and some apparently inoperable growths were rendered operable. The authors believe that growths which have not broken through their uterine shell are easily extirpated. Most important of all radium eradicates sepsis. Therefore it makes ideal pre-operative treatment. To its pre-operative use the authors attribute their low surgical mortality: 1 death in the 51 Wertheim operations occurring in their five year cases and 4 operative deaths occurring after the 112 radical operations performed since 1930.

The operability rate for the 260 cases treated was 45.8 per cent. for the 103 five year cases, 49.5 per

cent. If there was doubt regarding operability the final decision was made at laparotomy. Even superficial invasion of the vaginal wall was not considered a contraindication to operation. The fifth week after radium application was regarded as the best time for operation. Before that time the tissues were swollen and vascular and later they became indurated. The difficulties of isolating the ureters being increased. During the intervening weeks between the administration of the radium and the operation the patients are brought to the highest pitch of physical fitness. The radical operation should be attempted only in those clinics in which the highest degree of team work is possible.

The pelvic lymphatic glands were found to be involved in about 23 per cent of the cases. Whenever the obturator glands were involved there was an early recurrence. The authors believe that radiotherapy makes no impression whatever on lymphatic metastases. Therefore they rarely employ x-ray therapy.

The results which are given in numerous tables are compared with those obtained in 6 leading centers. Among the 103 five year cases treated 33 or 32 per cent of the patients were alive and well at the end of five years. Fifty-one patients were operated upon: 8 in Stage I, 20 in Stage II and 14 in Stage III. 32 survived for five years, a cure rate of 62.7 per cent. Only 1 of the 52 patients treated with radium alone survived for five years. The immediate mortality from radium therapy was 7.7 per cent. In the most advanced cases in which radium therapy was considered useless the necrotic tissue was curetted away and zinc chloride or acetone was applied. This relieved bleeding and discharge.

The authors are convinced that in every case possible the patient with cancer should be submitted to radical surgery. DANIEL G. MORTON, M.D.

Daels F. The Intra Abdominal Radiation in Carcinoma of the Cervix (Zur intraabdominalen Radiumbestrahlung bei Cervix carcinom). *Zent bl f Gynaek* 1935 p 453

In order that the parametrium and the region of the iliac glands be better irradiated with radium, the author planted four metallic hollow tubes into the abdomen by means of four abdominal incisions in the anterior abdominal wall. The tubes were placed into the pouch of Douglas and into the vesico uterine fossa where they were left for two weeks. Into the lumen of these tubes radium preparations were placed as near the region of the involved tissue as could be determined by palpation. At the same time the carcinoma was radiated from the vagina as usual. The average dose by the abdominal route amounted to 10,500 mgmh in fourteen days by the vaginal route approximately 6,250 mgmh. In more recent times this dosage has been increased.

Of 35 patients treated in this manner 2 died during treatment, one from infection, the other from embolism. The results of the treatment cannot yet be reported. (VON SCHLUBERT) WILLIAM C. BUCK, M.D.

for by the fact that 229 of the myomectomies were secondary procedures. It is of importance that 25 per cent of the patients who were less than forty years of age were known to have recurrences, as contrasted with 8.9 per cent of those who were more than forty years of age. Of the group of 111 who had recurrences, only 26 required a subsequent operation.

The incidence of fertility was determined for all patients with the exception of 8, or 2.1 per cent, regarding whom the information was not available prior to operation. This incidence was 61.3 per cent, but 26.9 per cent of the fertile patients had experienced only miscarriages.

Subsequent to myomectomy, 68 of the 409 patients who were less than forty years of age at the time that myomectomy was performed became pregnant and bore a total of 84 babies. The postoperative fertility was accurately determined for 196 patients, less than forty years of age, among whom pregnancy could reasonably be studied, which gives an incidence of 34.7 per cent postoperative fertility. In the presence of a postoperative incidence of fertility of 34.7 per cent, myomectomy should certainly be regarded as a favorable procedure during the reproductive period, especially when the mortality is not higher than that associated with radical procedures.

ADNEXAL AND PERIUTERINE CONDITIONS

Novak, E., and Gray, L. A. Dysgerminoma of the Ovary. *Am J Obst & Gynec*, 1938, 35, 925.

This paper is based upon the study of 17 cases of dysgerminoma of the ovary. While hitherto only 72 cases have been recorded in the literature, reports of cases of this tumor are now multiplying so rapidly that it may be considered not an exceedingly rare tumor type. Neither gynecologists nor pathologists have become generally familiar with the clinical and pathological characteristics of ovarian dysgerminoma. The microscopic picture is so distinctive that the diagnosis should rarely present any difficulty, certainly far less than the diagnosis of granulosa-cell carcinoma or arrhenoblastoma, both of which present many possible histological variations and gradations.

Since these tumors arise from cells dating back to the undifferentiated phase of gonadal development, it is not surprising that an exactly similar tumor, the well-known seminoma, occurs in the testis, and since dysgerminoma is made up of sexually indifferent cells, it is not surprising that dysgerminoma exhibits no endocrine activity. In this respect it differs from the feminizing granulosa-cell carcinoma and the masculinizing arrhenoblastoma. Dysgerminoma is often observed in sexually underdeveloped or pseudohermaphroditic individuals, but it has nothing to do with the production of these sex abnormalities, which persist even after removal of the tumor.

While dysgerminoma is undoubtedly a malignant type of tumor, there are marked variations in the degree of malignancy of individual tumors. The outlook is very favorable when the tumor is unilateral, with intact capsule, since 9 of 10 patients with such tumors have remained well after operation. The results are much less favorable when the capsule has been broken through, with extensive infiltration of surrounding organs, and perhaps metastases. Even when there is considerable infiltration, with incomplete removal, some patients have been apparently cured by postoperative irradiation, which we believe is a valuable adjunct in such cases. The general principles of the treatment of ovarian dysgerminoma are discussed on the basis of what has been learned as to their varying malignancy.

EDWARD L. CORNELL, M.D.

Norris, E. H. Granulosa-Cell Carcinoma. A Malignant Ovarian Tumor Associated with Endocrinological Effects. *Am J Cancer*, 1938, 33, 538.

There are two of the ovarian neoplasms which may properly be separated from the others and classified together on the basis of certain peculiar effects which they produce. These are the arrhenoblastomas and the granulosa-cell carcinomas. They are grouped together because each appears to produce a hormone which is physiologically active in the body of the host.

A case of granulosa-cell carcinoma in a fifty-two-year-old woman is reported. The world's medical records include the reports of many more than 100 cases of granulosa-cell carcinoma. The granulosa-cell carcinoma may be defined as a malignant tumor of the ovary, the histological structure of which commonly and characteristically shows the presence of granulosa-like cells which manifest a tendency to surround more or less typical follicles. The tumor is associated with signs and symptoms which may be ascribed to degrees of hyperestrinism. The granulosa-cell carcinoma may develop in any of the decades of life and the principal clinical manifestations vary with, and depend almost entirely upon, the age of the patient, and upon the epoch of the female sexual cycle in which the tumor develops. In children, the granulosa-cell carcinoma is a cause of precocious puberty. In the older age groups the effects are chiefly concerned with menstrual phenomena. The general course of the disease is continuous and progressive, and untreated cases go on to death from malignant metastases. Early surgical removal of the primary tumor is the only hope of permanent relief and, in general, the operative procedure should be of a radical nature. The postoperative result is good, and the symptoms disappear if the tumor can be removed.

The differential diagnosis upon clinical grounds is not difficult in children or in women past the menopause, but it may be impossible in women seen during the reproductive epoch.

The histological structure of the granulosa-cell carcinoma is variable within wide limits, the pattern

relative cure rate 25.3 per cent. For the period from 1914 to 1929 inclusive 1,501 patients were treated among 1,650 who were examined with a view to treatment. One hundred and sixty three were in Stage 1, 441 were in Stage 2, 624 were in Stage 3, and 364 were in Stage 4. At the end of five years 361 patients were alive without recurrence, 28 were alive with recurrence, 1,170 had died of cancer and 31 had died from intercurrent disease. The absolute cure rate for the five year period is given as 21.5 per cent and the relative cure rate as 22.8 per cent. The relative cure rates for the four stages for a five year period are as follows: Stage 1, 54 per cent; Stage 2, 34.7 per cent; Stage 3, 16 per cent; and Stage 4, 5.5 per cent.

CHESTER C. DOWERY, M.D.

Heyman, J. Atlas Illustrating the Division of Cancer of the Uterine Cervix into Four Stages According to the Anatomoclinical Extent of the Growth. League of Nations Health Organization, 1938.

In a small atlas containing 37 diagrams the League of Nations Health Organization has outlined the division of cancer of the uterine cervix into four stages according to the anatomoclinical extent of the growth. This volume was prepared by the author and M. Strandquist of the Radium hemmet of Stockholm. Due to the fact that the rules for the allocation of cervical carcinoma to stage have been differently interpreted which fact tend to defeat the efforts of the committee to secure comparability in the statistics the preparation of such a volume was undertaken with the idea that by following the rules and studying the diagrams contained therein a greater uniformity of grouping would result. The greatest confusion occurred in differentiating between Stage I and II. The committee includes in Stage IV those cases in which the bladder or the rectum is involved or in which the growth has spread outside of the true pelvis. Definition of the four stages are given they are based on anatomoclinical findings. General rules to be followed in questionable cases are outlined.

Stage I. Carcinoma confined to the cervix.

Stage II. Carcinoma which infiltrates the parametrium on one or both sides but does not invade the pelvic wall carcinoma which infiltrates the vagina but does not involve the lower one third and endocervical carcinoma which has spread to the corpus.

Stage III. Carcinomatous infiltration of the parametrium which has invaded the pelvic wall on one or both sides carcinoma with no cancer free space between the tumor and the pelvic wall carcinoma which involves the lower one third of the vagina and carcinoma with palpable metastases on the pelvic wall irrespective of the primary growth.

Stage IV. Bladder involvement as determined by cystoscopic examination or by intravaginal fistula carcinoma which invades the rectum and has spread outside the true pelvis below the vaginal inlet and above the pelvic brim distant metastases.

Graphic diagrams illustrating each of the above stage are of much help in following the definition suggested by the committee.

All subject matter is presented in English, French and German.

By following the classifications as outlined in the Atlas a greater uniformity of statistics for comparability would result and it is needless to add that this would be most desirable.

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CHRISTOPHER C. DOWERY, M.D.

Counsellor, V. S. and Bedard, R. E. Uterine Myomectomy. J. Am. Med. Ass. 1938, 111, 675.

In the years from 1915 to 1933 inclusive abdominal myomectomy was performed in 523 cases of uterine myoma at the Mayo Clinic. In the same period about 3,400 hysterectomies were performed for leiomyoma of the uterus. In 294 cases the myomectomy was a primary operation and in 229 cases it was a secondary procedure.

The operations were performed in each instance a conservative method to maintain in so far as possible the reproductive and menstrual function. In a few instances among patients beyond the reproductive period the adnexa were removed myomectomy being performed as a secondary procedure. Sixty three and three tenths per cent of the patients were in the fourth decade of life and the average age of all patients was thirty six and seven tenths years.

The menstrual period may be normal among patients who are candidate for myomectomy. In this series the period were normal in 38 per cent of the cases. Dysmenorrhea was a prominent symptom in 47.4 per cent of the patients who had abnormal menstrual period.

The situation of the tumor with respect to the uterus is an important factor in a myomectomy that is in so far as possible all myomas should be enucleated through the anterior surface of the uterus or through the anterior leaf of the broad ligament so as to minimize the risk of later intestinal obstruction.

Ovarian disease was associated in approximately the same number of cases as observed when hysterectomy was done for leiomyomas in general. In this series it was 47.4 per cent.

Myomectomy in pregnancy is indicated only in exceptional instances. There were 22 cases of intrauterine pregnancy in which myomectomy was performed in 31.8 per cent of these cases the patient had a miscarriage postoperatively. Seventy three and two tenths per cent of those who did not have a miscarriage had normal births. There was only 1 case in which cesarean section was performed. Myomectomy therefore is not to be regarded as too important a factor in subsequent delivery.

The recurrence of leiomyomas in this series was approximately 0 per cent which is somewhat higher than that currently reported but is accounted

for by the fact that 229 of the myomectomies were secondary procedures. It is of importance that 25 per cent of the patients who were less than forty years of age were known to have recurrences, as contrasted with 8.0 per cent of those who were more than forty years of age. Of the group of 111 who had recurrences, only 26 required a subsequent operation.

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Subsequent to myomectomy, 68 of the 400 patients who were less than forty years of age at the time that myomectomy was performed became pregnant and bore a total of 84 babies. The postoperative fertility was accurately determined for 106 patients, less than forty years of age, among whom pregnancy could reasonably be studied, which gives an incidence of 34.7 per cent postoperative fertility. In the presence of a postoperative incidence of fertility of 34.7 per cent, myomectomy should certainly be regarded as a favorable procedure during the reproductive period, especially when the mortality is not higher than that associated with radical procedures.

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relative cure rate 25.3 per cent. For the period from 1914 to 1929 inclusive 1591 patients were treated among 1690 who were examined with a view to treatment. One hundred and sixty three were in Stage 1, 441 were in Stage 2, 623 were in Stage 3 and 364 were in Stage 4. At the end of five years 362 patients were alive without recurrence, 28 were alive with recurrence, 1170 had died of cancer and 31 had died from intercurrent disease. The absolute cure rate for the five year period is given as 21.5 per cent and the relative cure rate as 22.8 per cent. The relative cure rates for the four stages for a five year period are as follows: Stage 1, 54 per cent; Stage 2, 34.7 per cent; Stage 3, 16.2 per cent; and Stage 4, 5.5 per cent. CHESTER C. DOHERTY, M.D.

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The operations were performed in each instance as a conservative method to maintain in so far as possible the reproductive and menstrual functions. In a few instances among patients beyond the reproductive period the adnexa were removed, myomectomy being performed as a secondary procedure. Sixty-three and three tenths per cent of the patients were in the fourth decade of life and the average age of all patients was thirty-six and seven tenths years.

The menstrual periods may be normal among patients who are candidates for myomectomy. In this series the periods were normal in 38 per cent of the cases. Dysmenorrhea was a prominent symptom in 47.4 per cent of the patients who had abnormal menstrual periods.

The situation of the tumor with respect to the uterus is an important factor in a myomectomy; that is, in so far as possible all myomas should be enucleated through the anterior surface of the uterus or through the anterior leaf of the broad ligament so as to minimize the risk of later intestinal obstruction.

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The recurrence of leiomyomas in this series was approximately 20 per cent, which is somewhat higher than that currently reported but is accounted

In general, the results obtained seemed to be better in the patients with a complete amenorrhea than in the menopausal patients who were still menstruating. An average reduction of 66 per cent in the number of hot flushes per day was obtained in the patients still menstruating. In the non-menstruating patients the hot flushes were frequently reduced from 40 or 50 to 1 or 2 a day. Usually there was a decrease in irritability, sleeplessness, and fatigue symptoms. Migraine was relieved, as were some cases of menopausal arthritis.

One disturbing effect of the treatment was the reappearance of uterine bleeding in an occasional previously non-menstruating patient. However, all bleeding ceased when injections were discontinued or the dosage was decreased.

The authors are of the opinion that the criteria of the time when estrogenic therapy should be started and terminated in a menopausal patient rest entirely on the symptoms presented. Treatment should be started when distressing symptoms, such as hot flushes, sweats, and insomnia, are present. Treatment should be continued as long as such symptoms persist. The length of treatment which was found necessary in this series of patients varied from six months to three or more years. The average length of treatment was not stated.

RONALD R. GREENE, M D

Davis, M E, and Koff, A K. The Experimental Production of Ovulation in the Human Subject. *Am J Obst & Gynec*, 1938, 36 183

For the first time it has been possible to produce ovulation in women by the intravenous use of a gonadotropic hormone derived from the serum of pregnant mares. This hormone has been isolated in such a great degree of purity that its administration by way of the intramuscular or intravenous route is devoid of danger, provided that suitable safeguards are established.

Biologically, this gonadotropic hormone resembles extracts and implants of the anterior lobe of the hypophysis, but differs chemically and biologically from all other gonadotropic substances heretofore studied. These experimental ovulations have provided the earliest human corpora lutea yet described. Clinically, this gonadotropic hormone should prove efficacious in the therapy of patients in whom follicle growth and ovulation are at fault.

The clinical application of this experimental work presents certain problems. The majority of the group of patients used in this experiment were probably having normal ovarian activity and periodic ovulations. To produce artificial ovulation in women with normal ovaries may be less difficult than to do so in women who have little or no ovarian activity. The therapy of this new gonadotropic material involves the treatment of patients in whom ovarian failure has resulted in a lack of follicle development and an absence of normal ovulation, with their concomitant menstrual abnormalities or infertility. In these women the dosage of the hormone, the inter-

val, and the method of its administration will determine to a large measure the success of the therapy.

EDWARD L. CORNELL, M D

Dodds, E C, Lawson, W, and Noble, R L. Biological Effects of the Synthetic Estrogenic Substance 4 4-Dihydroxy-a β -Diethylstilbene. *Lancet*, 1938, 234 1389

The authors report briefly that the administration of diethylstilboestrol (4 4-dihydroxy-a β -diethylstilbene) in doses of from 1 to 200 mgm twice daily for three days produced growth of the uterus in ovariectomized rats. Mating occurred in the rats which had received the 200 mgm dosage, but not in those which had received smaller doses.

A comparative assay with estrin showed that 0.25 mgm of the synthetic substance produced the same vaginal response as that obtained from 0.60 mgm of estrin. The action on immature rats was the same as that seen in ovariectomized animals. Typical uterine proliferation was obtained when progesterone was administered after preliminary sensitization with the diethylstilboestrol. The substance was found to be only one-fifth as potent as estrin in producing mammary growth in males.

THOMAS C. DOUGLASS, M D

Mahfouz, N P. Urinary and Fecal Fistulas. *J Obst & Gynec Brit Emp*, 1938, 45 405

The author has had a large experience with vesicovaginal and rectovaginal fistulas, having treated some 400 of the former and 75 of the latter. Today, as a result of the efforts of the Ministry of Public Health in Egypt, the number of cases of fistula is decreasing rapidly.

Urinary fistulas usually follow labor in cases in which nature has attempted to force the presenting part through the pelvic brim in the face of disproportion between the pelvis and the presenting part, or, when the presentation is abnormal. In such circumstances the membranes rupture prematurely. In consequence, the presenting part is forced against the brim of the pelvis or gets tightly impacted therein. The vesicovaginal septum and the cervix, if the latter is not dilated, become tightly compressed against the back of the symphysis. As a result of the continued pressure the tissues undergo necrosis and slough away. The duration of compression in such cases is usually long. The slough separates at about the fifth day of the puerperium and urine dribbles involuntarily into the vagina. Fistulas following labor can also result from direct injury received during the operative procedures used for delivery. Failure to empty the bladder before the application of instruments favors such injuries. Other causes of fistulas are lacerations produced in labor, malignant ulcerations, roughness on the part of the husband in attempting to force an opening in newly married girls, over-radiation, injuries following surgical operations, and such rare causes as ill-fitting pessaries, calculi, and foreign bodies introduced into the vagina. The principal symptom is incontinence of

varies from typical follicle like structures broad epithelial bands and narrow cords to sarcoma like pictures. There seems to be no advantage in the subdivision of the granulosa cell carcinomas on the basis of their differing histology. As yet the evidence is too meager to make significant the separation of the so called thecoma or the fibroma thecocellulare xanthomatodes ovarii into distinct groups. Cohnheim's theory of embryonic cell rests the theory elaborated upon and adopted by Robert Meyer as an explanation for the origin of the granulosa cell carcinoma cannot be accepted as adequate.

JOSEPH K. NARAT M.D.

EXTERNAL GENITALIA

McIndoe A. H. and Banister J. B. An Operation for the Cure of Congenital Absence of the Vagina. *J. Obst. & Gynaec. Brit. Emp.* 1938 45 490

While there is no settled opinion as to the correct management of congenital absence of the vagina three procedures have been used by those who favor surgical treatment. The authors briefly present a description of each.

In the first free skin grafts which are usually in multiple small pieces are applied to the wall of the cavity made between the rectum and the bladder. These are maintained there by some form of flexible or rigid mold for from seven to ten days. When the mold is removed the calibre of the cavity is maintained as far as possible by intermittent dilatation. As seen from reported cases the results are indifferent and appear to run parallel with the efficacy of the subsequent dilatation.

In the second method pedunculated flaps are used. The application of the Gillies tubed pedicle may give good results. It is not an easy method is liable to complications and will produce considerable scarring of the thighs.

In the third and final type of operation a loop of small intestine is used for the formation of the new vagina. This type of operation has a mortality of from 10 to 20 per cent and its technique is difficult. There is no doubt that so formidable an operation would never have been used to any extent if the simpler method of free skin grafting had been satisfactory.

After a study of the various methods of skin grafting the authors noted that the major problem was to maintain the patency of the cavity once the grafts had taken. When left to itself free grafted skin uniformly undergoes a contractile phase most marked on concave surfaces. This phase lasts from three to six months. If the graft is prevented from shrinking by a continuous stretching force throughout the entire period of contraction the contractile phase does not occur. Intermittent dilatation is an inadequate measure to prevent contraction and hence vaginal free grafts have not been satisfactory.

The authors report the case of a woman aged twenty-two years who had never menstruated. On routine examination it was found that the

vagina was absent. Before the operation to cure the congenital absence of the vagina a hollow vulcanite mold completely closed at both ends was prepared by a dental colleague of the author. A thin razor graft was cut from the inner surface of the left thigh. The mold was covered with the skin graft with the raw surface outward. The plane of cleavage between the rectum and the bladder was entered through a vertical incision in the midline in the space between the urethral meatus and the anus and a cavity large enough to accommodate the vulcanite mold was established by blunt dissection. The mould covered by skin was inserted and removed at the end of three and one half months. The skin graft had taken perfectly except along a small edge. When examined after five months the new vagina was completely healed and showed no evidence of contraction either in length or in breadth.

In conclusion the authors state that the procedure described has been carried out in two other cases both of which are still in the intermediate stage. Their only modification in technique was to reduce the size of the vulcanite mold. Inasmuch as the period in which shrinkage occurs is variable it is recommended that the mold should be left alone for six months and after that a glass vaginal rest be used nightly until such time as the introitus is soundly healed.

HERBERT F. THURSTON M.D.

MISCELLANEOUS

Wiesbader H. and Kurzrok R. The Menopause. *Endocrinology* 1938 23 32

This article is a discussion of the therapy of menopausal symptoms primarily by the use of estrogens. It is based on the observation of 200 women with menopausal symptoms. The menopause was spontaneous in 160 surgical in 34 and due to radiation in 6. The patients were followed up at least six months and on the average not more than three years.

Various estrogens were used. Estradiol benzoate (progyon B) and estrone (theelin and amniotin) in oil were given intramuscularly. Estrone (amniotin) estrinol (theelol and emmenin) and estradiol (progyon DH) were given by mouth. It was found that it was necessary to give large doses at the beginning of the treatment. Consequently the usual plan was to give 50,000 I.U. twice a week for the first four weeks. As symptoms were brought under control the interval between the doses was increased. When the interval between injections reached from twelve to fourteen days the dose was gradually decreased to from 2,000 to 4,000 I.U. Still later the attempt was made to give the patient mouth therapy with from 600 to 1,000 I.U. once or twice daily.

In addition all patients were given from 3.0 to 4.5 gm. of calcium daily and also 1 c.c.m. of an oil solution of an alcohol ether extract of ovary (Ustomensin) with each injected dose of crystalline estrogen. The rationale of the use of this substance was not entirely clear but it seemed to be of value.

reaction is obscure. Dietary irregularities and infection appeared to be ruled out as possible contributory factors. The possibility of the skin-radiation reaction zones' having liberated some histamine-like substance is mentioned. Possibly dehydration played some rôle in the terminal event. Without being able to determine a specific cause, one must conclude that the tolerance of a certain few individuals to roentgen radiation is markedly below normal.

DANIEL G. MORTON, M.D.

Smith, F. R. Palliation of Cancer in Gynecology
Am J Roentgenol, 1938, 39 866

A great many papers presenting the percentages of five and ten-year cures of various types of carcinoma have been written. Very little, however, has been said about the discomforts, disfigurements, and other obnoxious conditions following attempted cures. Almost nothing is written about palliation in the treatment of malignant tumors. Yet, depending upon the particular variety of carcinoma, the condition is in an advanced and actually incurable stage in from 59 to 85 per cent of all patients who come to the doctor or hospital for treatment. The cancer symptoms for which treatment is most necessary are pain, hemorrhage, and obnoxious discharge.

Pain which is due to pressure of the tumor may be relieved by removal of the bulk, as is done in cases of vulvar and ovarian carcinomas, or by frequent paracentesis for ascites. Concerning the use of drugs, it has been found that compounds of the salicylates are best for the relief of pain in its first stages. Later, codeine is used. Morphine should be reserved for the last few weeks of the terminal stages. Alcohol injections, chordotomy, and hypogastric sympathectomy have strictly limited indications, however, such measures are of value if used within these indications.

Hemorrhage may often be controlled by actual cautery or irradiation. In the presence of low

hemoglobin the patient should be given a transfusion, repeatedly if necessary, for anemia patients tolerate poorly either irradiation or postcautery slough.

Foul discharge is evidence of necrosis of the tissues. The sloughing, fungating, bulky tumors of the vulva and cervix may be reduced greatly by means of the cautery. The use of prolonged divided doses of external roentgen rays for carcinoma of the cervix causes much of the infected sloughing lesion to disappear.

Pyometra is most commonly coincident with endometrial carcinoma, though it is occasionally present with carcinoma of the cervix. Thirty-nine per cent of patients with pyometra are found to have retroverted uteri and, since pyometra is present in 77 per cent of patients before any treatment has been administered, it is probably true that it is due primarily to the uterine postural state. It is likely that an earlier correction of the retroverted uterus would decrease the amount of palliation necessary at the later stage. The treatment in advanced cases is irrigation after drainage, with or without hysterectomy.

The incidence of fistula in patients with carcinoma of the cervix is higher in untreated patients than in those who have received irradiation therapy. Fistula, then, is primarily a manifestation of advancement of the disease. Infection is an important factor in its formation. Preliminary external roentgen irradiation reduces the extent of the infection and, in turn, the incidence of fistula. The repair of any fistula appearing after irradiation therapy should not be attempted until the patient has remained free of cancer for five years.

The author reports the cases of 6 patients. These cases are not presented as cures, but as examples of palliation of cancer in gynecological diseases that have been arrested for varying lengths of time.

RONALD R. GREENE, M.D.

urine this usually occurs after four or five days in patients in whom the fistula is due to pressure necrosis but appears at once if the fistula is present as a result of perforation or direct operative trauma. Incontinence is occasionally due to imperfect control incident to a relaxed sphincter. The constant dribbling of urine after a time produces dermatitis and excoriation of the vulva and vagina. The diagnosis is usually easy. Occasionally the injection into the bladder of a colored fluid assists in locating a small hole buried in scar tissue.

The treatment of vesicovaginal fistulas should not be attempted until the patient's general condition is excellent. The urine should be free from albumin and pus. Complete involution of the pelvic organs should have occurred and the vulval skin should be in good condition. At least two months should have elapsed since labor as nature sometimes effects a cure spontaneously. In the operative technique the author emphasizes the importance of good exposure. In bad cases a Schuchardt incision may be found necessary. The vagina is separated from the bladder by a circular incision around the fistula. From this incision two short longitudinal incisions are carried one upward towards the cervix and the other downward towards the meatus. A catheter or sound in the bladder pushed beyond the lower edge of the fistula acts as a counter point and facilitates the differentiation between bladder and vaginal walls. Mobilization of the bladder flaps is the most important step in the operation. The sutures should include a good bite of tissue but should neither perforate the bladder nor include the mucous membrane. The smallest round bodied needle which will hold the catgut should be chosen. The catgut should be of moderate thickness, tensile strength and hardened to resist absorption for thirty days. To insure inversion of the edges of the bladder flaps when the sutures are placed the needle should pierce the flaps 1 or 2 mm. away from the edge. The tissues should be handled gently and the knots should not be tied too tightly. Thinned-out vaginal tissues and scars should be removed from the flaps before the sutures are applied. When the sutures have been tied the permeability of the bladder should be tested. If no leak is discovered the vaginal flaps should be trimmed and brought together with silk worm gut sutures. These sutures should include a superficial bite in the bladder wall in order to obliterate possible dead space. A catheter is kept in the bladder for a period of seven days to prevent distention. The sutures are removed on the thirteenth day.

This technique can be modified to suit all different types of fistulas. Special problems are discussed in regard to difficult and complicated cases such as urethrovaginal fistulas, complete destruction of the urethra and partial or complete sloughing of the trigone. The suprapubic route, colpoceles and tranplantation of the ureters into the sigmoid are discussed. The author believes that these procedures are unsatisfactory and are rarely indicated.

Rectal fistulas have almost the same etiology as vesical fistulas. Pressure necrosis which accounts for the overwhelming majority of urinary fistulas is seldom the cause of fecal fistulas. The majority of the latter are due to the extension of a complete tear of the perineum into the rectovaginal septum. The lacerated edges of the perineum unite spontaneously (or by repair) in the lower part but remain united at the upper end where the tissues are thin. If the fistula is situated at the vaginal outlet it is incorporated in an incompletely healed perineal tear the perineum should be cut through. Thus the fistula is converted into a complete tear and is dealt with as such. In dealing with fistulas situated at a distance from the perineum the latter should not be cut through. These fistulas should be dealt with by a flap splitting operation performed on the same principles employed in the operation for urinary fistulas. The bowel are kept constipated for five to seven days. On the fifth day castor oil is given then an enema of 250 ccm. of olive oil. A soap enema is given two hours later.

A large number of plates illustrate this excellent article.
DANIEL G. MORRIS, M.D.

Cathie I. A. B. Ulceration of the Small Intestine Following Irradiation of the Pelvis. *Am J Roentgenol* 1938 39 895

During the radiation treatment of nearly 400 patients for carcinoma of the cervix uteri, 2 developed intractable diarrhea and died. The roentgen dosage was not excessive and the technique was the same as that for some hundred of other patients who stood the treatment well. The 2 cases are reported in detail. The general condition of both of these women at the beginning of treatment was good. Their ages were fifty nine and forty two respectively. In each case treatment was continued for seventeen days. The factors of treatment were 250 kv. 10 ma. filter 1 mm. of copper plus 1 mm. of aluminum; intensity 50 roentgens per minute (120 roentgens per minute in the second case); 5 field one anterior 10 by 10 cm. 2 posterior and 2 lateral each 10 by 15 cm. dosage to the tumor 3,000 roentgens. In each case severe diarrhea started during the second week when only some 1,500 roentgens had been given. In the first case diarrhea and prostration continued without remission and the patient died seventeen days after the termination of treatment. In the second case there was a brief remission of symptoms but the patient died fifty one days after the termination of treatment.

Autopsy findings showed extensive ulceration of the intestinal mucosa, most marked in the ileum and extending all the way up to the duodenum. Inflammation was absent. In the ulcerated areas the epithelium was simply cast off. Cultures of the feces were negative for pathogenic bacteria.

The generalized ulceration throughout the small intestine almost eliminates the possibility of a direct action of roentgen rays and infers a systemic effect manifested locally in the gut. The cause of this

for improved diagnosis and the reduction of mortality which has occurred

Notwithstanding the fact that recent advances have done much toward the perfection of diagnosis and treatment, there still remains a strong challenge to physiological and pathological investigators for little or no progress has been made toward the solving of the etiologic puzzle involved, nor do we know all we should concerning the interrelated pathology of these two conditions. There just begins to creep into the literature reference to the fact that interested pathologists are making apparently successful attempts to differentiate between the benign mole and the mole with malignant potentialities. There remains much to be done—careless and fragmentary reporting of cases must be avoided, because more harm than good is done by slipshod reporting and publishing of cases replete with inconclusive evidence, loose concepts must be abolished, more exact knowledge and better interpretation of the tests for gonadotropic hormone must be acquired, and a technique better than is at present extant is needed so that the presence of the most minute amounts of living chorionic tissue can be revealed. And it is to be hoped that pathologists, by more extensive and more painstaking examination of the mole, will ultimately be able to formulate criteria that will establish potential malignancy and thereby enable us to prophesy the advent or to determine the existence of chorio-epithelioma.

HYDATIDIFORM MOLE

Definition Hydatidiform mole, also known as mole, myxoma chori, vesicular mole, molar pregnancy, uterine hydatid, hydatid mole, dropsy of the villi, and Blasenmole, is a cystic degeneration of the chorionic villi (131). Hydatidiform mole should be considered as a pathological pregnancy (126).

Etiology The etiology of hydatidiform mole is unknown but seems to be in some specific fault in the development of chorionic villi. All moles¹ must be regarded as rapidly growing tumors of embryonic origin and of potential malignancy (131). The factor inducing the formation of hydatidiform mole lies in the ovum rather than any abnormality, endocrine or otherwise, of the mother (15). Clayton (28) declares it is quite generally believed that some degeneration takes place in the blood supply to the villus with the consequent atrophy of its cells and degeneration which may be cystic or fibrotic. There are those who are of the belief that it is the result of an

interference with the development of the corpus luteum of pregnancy with the formation of lutein cysts. If the lutein cysts are the cause and not the result, the relationship of the hormones in the sexual cycle, at present believed to be the most logical conception, cannot be accepted. It is difficult to accept the endometrial theory (146). Some claim this disease to be fetal, others maternal, in origin, while some even attribute its origin to certain types of sperm cells. "Degeneration of the ovum or its parts caused by the hyperfunction of the corpus luteum, hypofunction of the corpus, a circulatory disorder, injury to the placental capillaries by toxic products from the maternal blood stream, overproduction of mucous tissue within the villi, into which it extends, at first alone but afterwards accompanied by blood vessels, a maldevelopment of the blood vessels" are factors which Hollósi (81) holds to be responsible for this disease.

Comment That the condition is a cystic degeneration of the chorionic villi and that the fault lies in the embryonic cells seem to be accepted by all. The fact remains that the etiology of hydatidiform mole is unknown, as unknown as that of cancer.

Incidence and Age Incidence It is generally conceded [Ruzicka (141), Lull (99), Suhonen (157), Brews (15), Engelhart (49)] that hydatidiform mole occurs in about 1 of 2,000 cases of pregnancy. These figures are arrived at by study of large groups of cases. Some see many cases of mole throughout an active life, others see very few.

It is generally conceded that a great many moles occur after the age of forty. Brews (15) found that 37.5 per cent of his patients were over forty years of age. Feenders (55) reports the case of a fifty-five-year-old multipara who had a mole. Sherman (146) quotes Vassbuch and Vermeheu as having found 20 pregnancies in women of fifty years or more, 25 per cent of whom had moles. However, 90 per cent of his own 78 patients were under forty years of age. Clayton (28) says that hydatidiform mole "is found during the child bearing period, but the age is otherwise not significant. Color or race is likewise not a factor. The parity is of no importance, since hydatidiform mole occurs in primipara as well as in multipara."

Comment It is obvious from a review of this literature that the incidence and age incidence are variable. My own experience with hydatidiform mole has been 1 in 600 cases. The incidence and age incidence are only of didactic importance. Mole is a rare disease at or near term, but probably the most

¹Mole is used with the meaning hydatidiform mole.

HYDATIDIFORM MOLE AND CHORIO-EPITHELIOMA

Collective Review of the Literature for the Years 1935, 1936, and 1937

ALBERT MATHIEU M D F A C S Portland Oregon

Part I

Introduction
Hydatidiform Mole
Biological Pregnancy Tests

INTRODUCTION

THE following study was made with the object of correlating and co-ordinating contemporary thought on the subject of hydatidiform mole and chorio epithelioma

We have had recourse to and have studied 179 articles some of which were abstracts and discussions. Other papers have also been published but we were unable either to obtain them or to have them translated. Our material however represents a good cross section of the world's literature on this subject for the last three years. Under some headings there will be found material which would apply to others but to avoid overlapping and repetition we have placed this material where it seemed pertinent and we hope the reader who is interested in only one phase of these diseases will read all in order to get the digest of the material.

While hydatidiform mole is seldom seen and while chorio-epithelioma is rare in the personal experience of any one man the bizarre nature of these diseases their biological peculiarities and their quality of incalculableness make them extremely interesting especially to obstetricians gynecologists surgeons and pathologists.

When the literature of the last few years is reviewed as a whole and contrasted with former writings it is plainly evident that there have been noteworthy advances and intelligent activity. Up to 1930 the diagnosis of hydatidiform mole rested practically on the presence of hydatid

vesicles on the spontaneous evacuation of the mole or on the postoperative examination of the tissue following curettage of the uterus and the diagnosis of chorio-epithelioma was rarely almost never made until metastases had occurred. An analysis of the extensive papers of Marchand (105) Findley (57) Vineberg (170) Caturam (25) and Szathmary (159) including approximately 1500 cases of chorio-epithelioma and probably 10 times as many moles revealed the fact that prior to 1930 the mortality rate of hydatidiform mole was approximately 12 per cent and that of chorio-epithelioma 60 per cent (not counting the untold suffering due to prolongation of the disease and metastases). The present study involving 576 cases of mole and 266 cases of chorio epithelioma reveals the fact that the mortality rate is now approximately 2 per cent and 10 per cent respectively.

Since 1929 when Zondek discovered that gonadotropic hormone was present in the urine of patients with hydatidiform mole and in a much greater amount than in patients with a normal pregnancy and since 1930 when the same discovery was made with relation to chorio epithelioma the diagnosis treatment and prognosis have changed to a remarkable extent. Following the advent of the Aschheim Zondek test the clinician had an excellent laboratory test to guide him toward a definite diagnosis. Once this knowledge became general more thought was given to these diseases as possible diagnoses in a given case and there evolved keener and quicker diagnosis earlier treatment and markedly improved prognosis.

At the present time it seems that diagnostic criteria are adequate but that diagnostic acumen is lacking and that the maximum results in treatment are not being obtained because of inertia on the part of the clinician or non acceptance of the newer criteria. The main deterrent toward a more precise knowledge of these diseases is the fact that so few cases are seen by one man that it is difficult for anyone to gain sufficient experience in diagnosis and treatment to speak authoritatively. There is good reason to believe that a review of contemporary literature would enable us to assemble the important factors responsible

The common following are typical examples of the phases of these diseases. The papers of Marchand (105) Findley (57) Vineberg (170) Caturam (25) and Szathmary (159) including approximately 1500 cases of chorio-epithelioma and probably 10 times as many moles revealed the fact that prior to 1930 the mortality rate of hydatidiform mole was approximately 12 per cent and that of chorio-epithelioma 60 per cent (not counting the untold suffering due to prolongation of the disease and metastases). The present study involving 576 cases of mole and 266 cases of chorio epithelioma reveals the fact that the mortality rate is now approximately 2 per cent and 10 per cent respectively.

Part II—Chorio epithelioma the Female (Pregnancy) and the Biological pregnancy tests.

lutein cyst in the ovary accounted for the positive Friedman tests

Comment We have learned from the work of Philipp (132) that lutein cysts associated with hydatidiform mole or chorio-epithelioma store chorionic gonadotropic hormone in their fluid content. This appears reasonable because when there are great quantities of hormone in the blood, as there are in hydatidiform mole and chorio-epithelioma, it is obvious that this hormone will be present in all fluids in the body and, hence, of course, present in the fluid content of ovarian cysts. The fact that the fluid content of the lutein cysts associated with mole and chorio-epithelioma disappears gradually would readily explain the existence of a positive pregnancy test for weeks after the passage of the mole.

McClure (116) maintains that polycystic ovaries are frequently present and that the individual cysts are lined with 1 or more layers of lutein cells. He quotes Bland as having stated "definitely that in 95 per cent of cases of hydatidiform mole the ovaries are normal." It is the consensus of opinion that the cysts regress slowly but surely when the mole is evacuated, providing there is no remaining chorio-epithelioma, and that operation need not be done for the lutein cysts (146). A complication due to this enlargement of the ovaries associated with hydatidiform mole is torsion of these cysts. Such evidence has been produced by Daléas (35), Weill (175), Couvelaire (31), and Blaikley (10), and obviously operation must be done to relieve this complication.

Comment The presence of lutein cysts in conjunction with or following hydatidiform mole or chorio-epithelioma is a very interesting biological phenomenon. It appears obvious that these cysts are sequential rather than the cause of mole or chorio-epithelioma, and that since these cysts are apparently caused by the constant bombardment of an increased chorionic gonadotropic hormone in the secretions of the patient, it would appear that the longer the mole or chorio-epithelioma exists the larger they will become. Hence, we can expect to find fewer lutein cysts reported in the literature of the future since we have every reason to believe that ultimately the diagnosis of these diseases will be made early, that is, before sufficient time has elapsed for the formation of lutein cysts. In my cases of chorio-epithelioma following mole, in which the diagnosis was made early and hysterectomy done, there were no lutein cysts visible in any of the ovaries. It is obvious that removal of these cysts for any other reason than their torsion would have little effect on the primary pathological condition, although, I must admit, no one has reported the effect on the primary growth by the removal of the ovaries only.

Two facts must be borne in mind first, that the cysts regress when the primary focus is removed, therefore, the ovaries need not be removed because of the cysts, and second, since the fluid of the lutein cysts is capable of giving a positive biological pregnancy test, the test might be positive until complete regression of the cysts takes place, which will ultimately happen following the removal of the mole or chorio-epithelioma.

Symptoms All authorities agree that abnormal uterine bleeding is the outstanding symptom. This usually follows a period of amenorrhea of from one to several months. The bleeding may be continuous or intermittent, and it may last for weeks or months. At times there is merely spotting, at other times there may be a sudden gush of blood. Of a series of 127 cases (111), bleeding was the outstanding symptom in 122. A few patients (146) show no signs of hemorrhage whatever and the diagnosis is made from the findings of vesicles in the vagina or from the evacuation of the uterus without bleeding. Many patients complain of lower abdominal pain. Increased size of the uterus, with consideration of the period of amenorrhea, has long been a textbook diagnostic sign. However, Brews (15) noted that in 35 per cent of his cases the uterus was of normal size or smaller, and Sherman (146) found no relative difference in the size of the uterus in 35 per cent of his patients. Mathieu (111) in a series of 127 cases observed that the uterus was either normal in size or smaller in over half of them.

Toxemia is regarded as an outstanding symptom, and there is no doubt that many of the patients suffer from hyperemesis gravidarum, or toxemia of pregnancy. Sherman (146) reports "that nausea and vomiting and toxic manifestations occurred so often and with such propensity that a diagnosis of either hyperemesis gravidarum or toxemia of pregnancy, was made in a large number" of his cases. He elaborates more fully on this point, quoting DeLee as having seen 3 of 19 patients with toxemia, and states that in his series over 29 per cent of the patients showed definite symptoms of early or late toxemia. Brews (15) discovered albumin in the urine of 35 per cent of 34 patients, and Blaikley (10) speaks of "gross albuminuria and high blood pressure."

Anemia is an almost constant sign, owing to the blood loss (146). In the few cases of hydatidiform mole occurring in the tubes, the symptoms were found to be practically identical with those of unruptured or ruptured ectopic pregnancy (15, 131).

common of all diseases of the ovum during the early months of pregnancy hence many of the small ones are not diagnosed. The important factor is that any patient in the child bearing age might harbor a mole and therefore one must constantly have this condition in mind.

Pathology The literature of the last three years reveals little that is new in the pathological discussion of hydatidiform mole. Fraina (164) believes that the following are suspicious but not definite indications of malignancy: large masses of growing epithelial elements in either the decidua or the uterine muscle and the duration of the viability of these cells even when there are not many present.

Hertig (78) states that through the co-operation of pathologists, obstetricians and gynecologists he obtained the paraffin blocks and slides along with the follow up records of over 100 cases of hydatidiform mole. He studied these specimens with the idea of correlating the morphological picture in the original mole with the ultimate outcome and he believes that he has accomplished something in this matter. He assumes that certain moles are benign because of the presence of the following general histological picture: (1) normal chorionic epithelium, (2) slight or undoubtedly benign hyperplasia without mitoses or anaplasia, and (3) moderate to marked benign hyperplasia with occasional anaplastic cells that is those of increased size with enlarged irregular hyperchromatic and darkly staining nuclei. Hertig (78) reports a preliminary study of 24 cases, 12 of which he originally classified as being either benign, probably benign or possibly benign, respectively. In 1 of the cases which he classified as being possibly benign (and in which he broke his own rules) there subsequently developed chorio epithelioma. He diagnosed 1 other case as potentially malignant, probably malignant or malignant on the basis of 1 or more of the following features: (1) invasion of the villous stroma by relatively undifferentiated chorio-epithelial elements, (2) moderate to marked anaplasia in either with or without mitotic activity of the epithelium, and (3) tissue culture like growth of detached chorio epithelial elements usually in fairly large masses and growing upon the surface of a blood clot. Of 12 hydatidiform moles which he considered potentially malignant, probably malignant or malignant, 8 ultimately proved to be malignant. He concludes that Hirschmann's categorical statement that one cannot tell much about a mole by looking at it is not entirely warranted. Hertig (78) advises thorough study of many sections of

mole and thorough study of the curettages obtained at the time of removal of the original mole. He admits that 24 cases do not form a large enough series from which to draw conclusions of a sweeping nature even though a given trend appears to be fairly definite and is continuing his work in the attempt to get a really significant series of hydatidiform moles in order to study them carefully from a pathological standpoint. He invites obstetricians, gynecologists and pathologists to co-operate with him by sending material with histories.

Comment This report of Hertig is a challenge to pathologists to organize their material and study it meticulously not only with the idea of attempting to establish malignant potentialities in moles but to detect the early or small focus of chorio epithelioma. If this is to be accomplished it can be done only by correlated study on a mass of material. I do not doubt but that some day the malignant potentialities of a given mole will be determinable. Whether this will be done by the pathological investigator or by the endocrinological investigator remains to be seen. A wide exchange of material under the guidance of a unified group of competent pathologists might be the solution.

Condition of the Ovaries One of the most interesting complications or associations encountered in chorionic disease is bilateral polycystic lutein cysts. Practically all writers in this review have something to say about the condition of the ovaries in the presence of mole and chorio epithelioma. Sherman (146) thinks that cysts are significant in producing an extreme degree of toxemia and a relatively poor condition of the patient. Other authors believe with Novak that lutein cysts are a constant pathological occurrence in all cases of hydatidiform mole varying only in degree. In approximately 25 per cent of the cases (126) corpus-luteum cysts develop and many of them become considerably enlarged. The longer the mole lasts the larger are the corpus luteum cysts. Cysts which remain after the removal of the mole indicate that the removal has not been complete (164).

There seems to be no doubt in the mind of most [Mandelstamm (102), Phaneuf (131), Palmer (126)] that lutein cysts are the result of constant bombardment by the chorionic gonadotropic hormone that if this bombardment persists the lutein cysts enlarge and that when the original growth is removed the lutein cysts regress. Mathieu (111) in a study of 127 moles found that 14 were accompanied by lutein cysts. Mandelstamm (102) reports a case in which there was no chorionic tissue remaining in the body but the

lutein cyst in the ovary accounted for the positive Friedman tests

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Two facts must be borne in mind first, that the cysts regress when the primary focus is removed, therefore, the ovaries need not be removed because of the cysts, and second, since the fluid of the lutein cysts is capable of giving a positive biological pregnancy test, the test might be positive until complete regression of the cysts takes place, which will ultimately happen following the removal of the mole or chorio-epithelioma.

Symptoms All authorities agree that abnormal uterine bleeding is the outstanding symptom. This usually follows a period of amenorrhea of from one to several months. The bleeding may be continuous or intermittent, and it may last for weeks or months. At times there is merely spotting, at other times there may be a sudden gush of blood. Of a series of 127 cases (111), bleeding was the outstanding symptom in 122. A few patients (146) show no signs of hemorrhage whatever and the diagnosis is made from the findings of vesicles in the vagina or from the evacuation of the uterus without bleeding. Many patients complain of lower abdominal pain. Increased size of the uterus, with consideration of the period of amenorrhea, has long been a textbook diagnostic sign. However, Brews (15) noted that in 35 per cent of his cases the uterus was of normal size or smaller, and Sherman (146) found no relative difference in the size of the uterus in 35 per cent of his patients. Mathieu (111) in a series of 127 cases observed that the uterus was either normal in size or smaller in over half of them.

Toxemia is regarded as an outstanding symptom, and there is no doubt that many of the patients suffer from hyperemesis gravidarum, or toxemia of pregnancy. Sherman (146) reports "that nausea and vomiting and toxemic manifestations occurred so often and with such propensity that a diagnosis of either hyperemesis gravidarum or toxemia of pregnancy, was made in a large number" of his cases. He elaborates more fully on this point, quoting DeLee as having seen 3 of 19 patients with toxemia, and states that in his series over 29 per cent of the patients showed definite symptoms of early or late toxemia. Brews (15) discovered albumin in the urine of 35 per cent of 34 patients, and Blaikley (10) speaks of "gross albuminuria and high blood pressure."

Anemia is an almost constant sign, owing to the blood loss (146). In the few cases of hydatidiform mole occurring in the tubes, the symptoms were found to be practically identical with those of unruptured or ruptured ectopic pregnancy (15, 131).

Comment Bleeding pain and hyperemesis gravidarum or signs of toxemia are the outstanding symptoms but one must be cautious about depending on the textbook picture of enlargement of the uterus. This occurs only in about 50 per cent of the cases and usually after the mole is some months advanced in age. The fact that the uterus is of normal size or smaller does not of necessity preclude the possibility of mole. Any of the above symptoms should make one alert to the possibility of hydatidiform mole. Other symptoms are those of normal pregnancy.

I can recall very few references to the presence of breast changes in relation to hydatidiform mole and chorio epithelioma except in some cases of chorio epithelioma which were reported in connection with teratomatous tumors.

Diagnosis The diagnosis is based on a history of pregnancy during which there is more or less hemorrhage (131) the exhibition of hydatid cysts either passed spontaneously or evacuated by the curette practically clinches the diagnosis. If the uterus is particularly large for the period of amenorrhea one must be suspicious of hydatidiform mole. In advanced pregnancy the absence of fetal movements and the inability to visualize the fetal skeleton with the x rays are important factors (126). Excessive nausea and vomiting and anemia beyond the degree accounted for by the hemorrhage are important clues (61). The pitfalls in the diagnosis consist of other complications of pregnancy such as hydramnion with premature separation of the placenta or placenta previa as well as a pregnant uterus enlarged by the presence of uterine fibroids (61).

The most important single factor in the diagnosis of this disease is the test for chorionic gonadotropic hormone. Almost every author makes reference to its great value in diagnosis. The data and discussion concerning this hormone in its relation to hydatidiform mole and chorio epithelioma will be found under the heading

Biological Pregnancy Tests in this review.

Fetus with mole Some authors report cases in which a fetus was found together with a mole [Brouha and Kridelka (20) Ganner (66) Mathieu (111)] and the general belief is that in about 8 per cent of the cases a fetus is present (140). Nason (123) thinks that the presence of the fetus in connection with mole is not rare. He refers to the statistics of the Mall collection which contains fetuses in 64 per cent of the cases. In the case Maani (107) records there was a premature live fetus and the placenta was small but showed a sharp line of demarcation between the healthy and degenerated portions. Young (177) mentions a case of binovular twins. Both fetuses

were present and whilst one placenta was apparently normal there was an area of hydatid than e affecting the other.

Repeated molar pregnancies A few cases are published in which the patient had more than 1 mole (102 111) and Engelhart (49) reports the case of a patient who bore moles several times.

Simultaneous occurrence of mole and chorio epithelioma That mole and chorio epithelioma exist simultaneously much more often than is suspected is the opinion held by Mathieu (111). He bases this opinion on the fact that in the last few years chorio epithelioma following mole has been diagnosed so early in many cases. Engelhart (49) describes 1 such case. Mandelstamm (102) reports a case in which there were simultaneously a hydatidiform pregnancy in the uterus and a nodule of chorio epithelioma in the vagina and one in the uterus. Wegelin (174) speaks of a case of metastatic chorio epithelioma in the vulva associated with a mole. Mathieu (111) mentions 5 cases of simultaneous existence of these two diseases. Some (19) think that malignant degeneration of the mole occurs very early.

Comment It is my opinion that there are a great many more cases of simultaneous occurrence of mole and chorio epithelioma. My feeling is that in practically all the cases in which early diagnosis was made that is within two months of the existence of the mole the mole and chorio epithelioma in all probability existed simultaneously. In my own records I have another unreported case of such an occurrence.

Subsequent pregnancy After the mole has been completely evacuated and there is no occurrence of chorio epithelioma this episode has been no deterrence to pregnancy (15 35). Brews (15) states that after hydatidiform mole pregnancy is frequently normal.

Rupture of the uterus by mole Prior to 1935 there were reported 8 cases of spontaneous rupture of the uterus due to mole. In this study we found 2 such cases 1 reported by Brews (15) and 1 by McClure (116).

Comment Spontaneous rupture of the uterus is no doubt precipitated by perforation due to invasion of the growth.

Treatment The management of vesicular mole has been the subject of considerable discussion in the literature and has varied from ultra conservatism to radicalism. The possibility of the development of chorio epithelioma following the expulsion of this tumor has influenced each operator in making up his mind on one or the other form of treatment. Since no individual has

seen a large number of these pathological placentas, the operator has been actuated in his treatment by the number of cases of malignant degeneration which developed in his own series. In young women, evacuation of the mole by digital or instrumental curettage is the accepted procedure," according to Phaneuf (131). Many authors, however, sound warnings against this procedure, since curettage of a large cavum frequently results in perforation of the uterus followed in many instances by infection and peritonitis (81, 123). "A curettage under these conditions is a blind procedure which does not allow the discovery of invasive areas in the uterine musculature" (131). A few cases are reported in which the uterus has been ruptured by the curette, and some men have the firm belief that curettage aids in the dissemination of the chorionic villi (123). Traina (164) warns that curettement does not necessarily imply complete removal of the hydatid mole, and he maintains that bleeding which follows mole is not always due to the development of a malignant condition, but to degeneration and infection of retained molar products. All authors agree that curettement should be done carefully, but thoroughly.

In order to avoid the dangers of curettage, Schumann (quoted by Phaneuf, 131) advises abdominal hysterotomy for the removal of the mole. He suggests that the uterus, after it is exposed, be walled off with gauze and opened. The mole is then removed and the uterine cavity is under direct inspection. This operation is done not only for the purpose of removing the mole but also for detecting chorio-epithelioma which, in the words of Schumann, "is evidenced by a soft, friable hemorrhagic area into which the finger sinks, and from which small necrotic masses may be shelled out." Nason (123) says that "after evacuation, exploration with the finger should be made to detect a possible chorioneplithelioma." He also points out that "the evidence of a beginning chorioneplithelioma is detecting a soft friable hemorrhagic area into which the finger sinks and from which small necrotic masses may be shelled out."

Comment In 4 cases which the reviewer has seen there was no "soft, friable hemorrhagic area into which the finger sinks."

Other authors believe strongly in hysterectomy, particularly if the patient has had several children or if she is near the menopause. Okazaki (124) advocates hysterectomy in elderly women. Curtis is quoted (123) as believing, "On diagnosis, abdominal hysterotomy or hysterectomy

should be done for the following reasons (1) Patient usually exsanguinated and removing vaginally usually means loss of more blood (2) Lower removal leaves doubt as to whether all the tumor is removed, impossibility in determining extent of damage of uterine muscle. In making abdominal approach, it is possible to (1) Control hemorrhage better (2) Determine degree of penetration of syncytial masses into uterine muscle (3) Mole may be removed under the eye and uterine wall carefully inspected, thus determining more accurately whether malignant change is present or not."

Sherman (146), from his study of 78 cases at the Lying-In Hospital of the City of New York, outlines a suggested treatment which includes taking a complete blood count, blood-chemistry study, grouping and typing of blood, urinalysis, roentgenography (in an effort to outline fetal bony parts), and the biological pregnancy test. He states that when the diagnosis is uncertain the patient should be treated conservatively, but when the diagnosis is certain and the patient is in labor, she should be allowed to deliver the mole spontaneously. If she is not in labor, the membranes should be ruptured and the cervix should be packed. After there is a dilatation of 6 cm, the uterus should be emptied and digitally explored and packed. Sherman suggests that the uterus should be emptied with the least amount of instrumentation, bleeding should be controlled by packing, and the patient should have blood transfusions if necessary. He then recommends that all patients after delivery of a mole be curetted in two weeks, and that quantitative estimations of the chorionic gonadotropic hormone be made in order that possible malignancy may be detected. He warns against oophorectomy, remarking that "lutein cystomata will regress after removal of the mole."

Most authors recommend the immediate and cautious removal of the mole at the earliest opportunity, and include in their treatment a follow-up pregnancy test for a time—six months according to Tasovac and Mirjanić (161). Phaneuf (131) and others (39, 87, 111, 141, 149) recommend that the patient be observed for two years and that the pregnancy test be done monthly for the first year. Gough (72) believes that "The importance of the test in the follow-up of any hydatidiform mole cannot be over-emphasized. After such a pregnancy, the test should be done at least once a month, in the first month or two, even once a week." And he cautions that one should "not be content with one or even several negative results."

Comment When the diagnosis is uncertain the patient should be treated conservatively but once the diagnosis is certain it is probably best in most cases to empty the uterus at once through the vagina. However one must beware of hemorrhage, rupture of the uterus and infection. Notwithstanding the warnings regarding dissemination of chorionic villi it seems indubitable that the uterus should be emptied and packed if necessary. By all means the curettings should be very carefully examined not only that one may obtain the benefit of examination of numerous moles but that chorio epithelioma may be found if it exists simultaneously with the mole. My opinion is that digital manipulation inside of the uterus is antiquated and practically valueless because the curette will do all that the finger will do and better. When a patient is found to have a large mole particularly when she is near the menopause or has sufficient children it is probably better to do a supravaginal or vaginal hysterectomy. Large moles are very apt to perforate the uterus or to weaken its walls so that curettage is exceedingly dangerous.

I cannot approve of the advice of Schumann, Curtis and others that hysterotomy from above should be resorted to. In most cases that I have seen hysterotomy would not have revealed the chorio epithelioma. I am convinced that hysterotomy is subject to almost the same weaknesses and the same pitfalls in diagnosis as curettage. Both methods will reveal a chorio epithelioma which is projecting into the uterine cavity but neither will reveal a chorio epithelioma buried any place in the lateral wall of the uterus. I have seen 3 cases in which a midline incision through the anterior surface of the uterus did not reveal chorio epithelioma when it was present in the myometrium. Naive dependence on hysterotomy may result in tragic sequelae.

There is no doubt that an important part of the treatment of hydatidiform mole is watchfulness for the advent or presence of chorio epithelioma and that in the follow up treatment repeated biological pregnancy tests should be made. The results of these tests when correlated with the clinical findings will in most cases reveal the presence or absence of chorio epithelioma. The greatest pitfall in the follow up treatment of hydatidiform mole is the lack of knowledge that chorio epithelioma may ensue. The next greatest pitfall is the misconception of the biological pregnancy tests.

Incidence of mole terminating in chorio epithelioma It seems impossible to establish a percentage of the incidence of mole which terminated in chorio epithelioma. Schumann and Voegelin (143) in a study involving all the pregnancies within the corporate limits of Philadelphia for the years 1929 to 1933 inclusive found 78 cases of mole 8 of which terminated in chorio epithelioma a rate of approximately 10 per cent.

Mathieu (151) reports a rate of 9.4 per cent in 127 studied cases. In Brews (15) series of 7 cases 8.3 per cent terminated in chorio epithelioma. Phaneuf (131) who presumably reported all his personal cases of mole says that of 9 cases 4 terminated in chorio epithelioma. (In the reviewer's personal experience this incidence was 66 per cent.) On the other hand Sherman (146) who made a survey of 78 cases of hydatidiform mole occurring in the Lying In Hospital of New York City from 1898 to 1932 states: "Many obstetricians are of the opinion that the occurrence of chorio epithelioma is a frequent sequence to hydatidiform mole. It is of interest that only one patient with chorio epithelioma was found in 182119 obstetrical and 14280 gynecological patients. This malignant disease did not follow hydatidiform mole. The infrequency of this disease has been repeatedly stated in the literature. Symmers noted only one chorio epithelioma in 12000 autopsies. Lynch reported 7 in 2700 autopsies in the General Hospital of Vienna. Polak observed 10 patients with chorio epithelioma over a period of ten years none having had a previous history of hydatidiform mole. In the same period he saw 50 patients with hydatidiform mole and upon further investigation of 92 per cent of these no chorio epithelioma was found to be present. Others have reported similar findings. In the composite series of Giglio, Kehrer and DeLee totaling 94 patients with hydatidiform mole no subsequent chorio epithelioma was recorded. Sturgis recently reported that 10 patients whom she had observed over a period of ten years did not develop chorio epithelioma following hydatidiform mole."

Comment The difference of opinion as to whether chorio epithelioma follows mole seems to depend on the influence of one's own statistics. I naturally am seriously affected by the fact that of the cases of mole which I saw 66 per cent terminated in chorio epithelioma. However one cannot disregard the statistics given by others. The important fact is that any mole might exist simultaneously with a chorio epithelioma or might terminate in chorio epithelioma. In other words all hydatidiform moles are potentially malignant and there ain't no such animal attitude will affect one's diagnostic acumen. Hence any attention to incidence should be of didactic interest only.

Mortality The usual causes of death due to hydatidiform mole are hemorrhage, sepsis, peritonitis from rupture of the uterus either spontaneously by the curette or by the finger and metastases. Brews (15) reports that conservative treatment was adopted in the majority of his

72 cases (primary hysterectomy in only 6 cases) and resulted in a very low mortality, 1.4 per cent. Mathieu (111) found a mortality rate of 2.36 per cent in 127 cases of hydatidiform mole. Sherman (146), in his study of 78 cases of mole, showed a mortality of 2.5 per cent, and he explains, "The deaths were not due to hemorrhage or sepsis, but rather to unnecessary operative interference, i.e., immediate laparotomy for bilateral lutein cystomata." Weill (175) reports the death of a patient following laparotomy for torsion of lutein cysts.

In the 576 cases of hydatidiform mole covered by this review, there were 8 deaths, a percentage of 1.4. This does not include the deaths which took place in those cases of hydatidiform mole which terminated in chorio-epithelioma.

Comment. Any pregnancy might be complicated by or terminate in hydatidiform mole. Any mole may have malignant potentialities and should be considered guilty of transition into chorio-epithelioma until proved innocent. Cognizance of the newer diagnostic criteria and methods of treatment have led to a marked reduction of the mortality rate and to the early discovery of associated or resultant chorio-epithelioma.

BIOLOGICAL PREGNANCY TESTS¹

Most authors in the last three years have used biological pregnancy tests, qualitatively and quantitatively, in the diagnosis of hydatidiform mole and chorio-epithelioma. While the "Aschheim-Zondek pregnancy test" is no doubt the standard and the most widely used for the detection of the chorionic gonadotropic hormone, the one suggested by Friedman, using rabbits, seems to be most frequently employed in this country. It is as reliable as the older test, and much simpler. Modifications of this test have been made—Fluhmann (58), and Evans, Kohls, and Wonder (52) use rats, Gough (72) mentions the method used by William Tate, Jr., in which the test animals are albino rats (a modification of the technique described by Davis and Ferrill, 1932), Mathieu and Palmer (112) use young rabbits, about fourteen weeks of age, to avoid false positives due to the use of mature rabbits.

Cerebrospinal fluid has been used for the biological pregnancy test by Evans (50), Evans,

Kohls, and Wonder (52), Zondek (178), and Palmer (126). These authors contend that in mole and chorio-epithelioma the hormone is present in the cerebrospinal fluid, but in normal pregnancy it is not. Ewald (53) says that Hashimoto produced a positive Aschheim-Zondek reaction with 18 c cm of cerebrospinal fluid from a normal gravida, and that he himself obtained a positive Aschheim-Zondek reaction in the presence of chorio-epithelioma by the use of only 2.5 c cm of cerebrospinal fluid. In differentiating between normal pregnancy and chorio-epithelioma, he is of the opinion that the use of cerebrospinal fluid would greatly enhance our diagnostic ability.

In a study to determine the estrin content in cases of hydatidiform mole and chorio-epithelioma, Smith and Smith (151) found that "the oestrin content is very low, in fact, not demonstrable without concentration of the specimens by extraction", and that "the data presented indicate that the chorionic cells themselves, when they become neoplastic, do not contain oestrin in amounts comparable with those in normal placenta."

Qualitative estimation of chorionic gonadotropic hormone. "The hormonal pregnancy test is important not only for the early diagnosis of normal pregnancy, but also for the early recognition of pathologic changes in the placenta (hydatidiform mole, chorionepithelioma),"—Zondek (178). Palmer (126) says that the living chorionic tissue of the placenta of pregnancy or that of mole or chorio-epithelioma is the source of the urinary hormone that can be detected biologically, and that there is no qualitative difference in this hormone associated with normal or pathological pregnancy. He adds further that the continued excretion of the chorionic gonadotropic hormone after the removal of a mole or chorio-epithelioma may be due to slow elimination of the hormone from its storage tissues, notable among which are corpus-luteum cysts. Fluhmann (58) remarks, "The demonstration of the chorionic gonadotropic hormone in the blood and urine of women with hydatidiform mole and chorio-epithelioma has been accomplished by many workers. It is a discovery of the utmost clinical significance and may be of great value from the standpoint of diagnosis and therapy." In an analysis of 3,000 tests for gonadotropic hormone in the blood, urine, and tissue extracts (conducted in the Stanford Laboratory of Gynecology between the years 1928 and 1937), in order to differentiate between the "anterior pituitary sex hormones" and the "chorionic gonadotropic hormone," Fluhmann

¹As far as our present knowledge goes, all biological pregnancy tests are based on the fact that there is living chorionic tissue present in the host. Throughout this review biological pregnancy tests are referred to under many different names: viz., Aschheim-Zondek, using urine in mice; Friedman, using urine in rabbits; Brindeau-Hunglais, using blood serum in rabbits; Friedman-Brouha, using urine in rabbits; the pregnancy reaction; the pregnancy test; the test for chorionic gonadotropic hormone; content of prolan B. We have placed the discussion on the biological pregnancy tests at this point in the review to avoid overlapping and repetition.

Comment When the diagnosis is uncertain the patient should be treated conservatively but once the diagnosis is certain it is probably best in most cases to empty the uterus at once through the vagina. However one must beware of hemorrhage, rupture of the uterus and infection. Notwithstanding the warnings regarding dissemination of chorionic villi it seems indubitable that the uterus should be emptied and packed if necessary. By all means the curettings should be very carefully examined not only that one may obtain the benefit of examination of numerous moles but that chorio epithelioma may be found if it exists simultaneously with the mole. My opinion is that digital manipulation inside of the uterus is antiquated and practically valueless because the curette will do all that the finger will do and better. When a patient is found to have a large mole particularly when she is near the menopause or has sufficient children it is probably better to do a supravaginal or vaginal hysterectomy. Large moles are very apt to perforate the uterus or to weaken its walls so that curettage is exceedingly dangerous.

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There is no doubt that an important part of the treatment of hydatidiform mole is watchfulness for the advent or presence of chorio epithelioma and that in the follow up treatment repeated biological pregnancy tests should be made. The results of these tests when correlated with the clinical findings will in most cases reveal the presence or absence of chorio epithelioma. The greatest pitfall in the follow up treatment of hydatidiform mole is the lack of knowledge that chorio epithelioma may ensue. The next greatest pitfall is the misconception of the biological pregnancy tests.¹

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Comment The difference of opinion as to whether chorio epithelioma follows mole seems to depend on the influence of one's own statistics. I naturally am too easily affected by the fact that of the cases of mole which I saw 66 per cent terminated in chorio epithelioma. However one cannot disregard the statistics given by others. The important fact is that any mole might exist simultaneously with a chorio epithelioma or might terminate in chorio epithelioma. In other words all hydatidiform moles are potentially malignant and the therapist no such animal attitude will affect one's diagnostic acumen. Hence any attention to incidence should be of didactic interest only.

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villi which in places contained nests of syncytial cells varying considerably in size and shape." This tissue was regarded as somewhat suspicious, but the Friedman test was negative. It was then submitted to a tumor conference and a diagnosis of deciduitis was returned. Two months later the patient re-entered the hospital complaining of daily vaginal bleeding since the operation. The pelvic examination was negative, and curettings showed no evidence of chorio-epithelioma. Another Friedman test at this time was negative. After this test the patient had a massive hemorrhage. Examination revealed a necrotic mass protruding from the cervix. Attempt at digital removal resulted in severe hemorrhage which necessitated immediate transfusion. At this time the Friedman test was strongly positive for the first time (If I can ascertain correctly, this was five months after the last negative test). "After two days a rapid vaginal hysterectomy was performed with frequent blood transfusions, and three weeks after operation the Friedman test was again negative. The patient was discharged for further observation, rapidly developed cerebral metastasis, and died some five months subsequent to operation." The authors comment as follows: "In reviewing this case it is now obvious that the first curettings which were considered to be deciduitis were in reality chorionepithelioma, and it is important to note that operative procedures were inexcusably delayed by reason of the persistent negative biologic tests."

Comment On the contrary, it appears to me, on reading this case history, that while there was no chorio-epithelioma the test was negative, and when the chorio-epithelioma appeared—from an intervening pregnancy (?) as the patient failed to inform them concerning 1 pregnancy—the test was positive. The last negative Friedman test is unexplainable except on the basis of laboratory error.

Fredrikson (63) quotes Rosenstein and Castallo as each having described a case showing negative tests between the delivery of a hydatid mole and the development of chorio-epithelioma. He suggests, for this reason, that several tests be required.

Hajek and Bareuther (75) could not explain negative hormonal reactions in the presence of histologically demonstrated brain metastases of malignant chorio-epithelioma. They warn against deductions from a single negative reaction, and call attention to Zondek's demands for avoidance of an erroneous diagnosis by repeating the hormone analysis after several days.

Lazard and Kliman (92) report a case in which a pathological diagnosis of typical proliferation

of a chorio-epithelial type was made from curettings. The Friedman test, which was negative four days prior to the curettage was strongly positive four days after the curettage. On this basis, panhysterectomy and bilateral salpingo-oophorectomy were performed. The microscopic examination of the uterus revealed a "structure typical of syncytial endometritis." Twelve days after this operation, the Friedman test again became negative, and continued to be negative.

Comment Analysis of this case would make one think that the negative Friedman test prior to the removal of the mole was a false negative, probably due to laboratory error.

Linett (98) reports that six days after the passage of a large mole the Friedman test was negative. The following day curettage was done. There was no evidence of hydatidiform mole, and the pathological diagnosis was "endometrium of pregnancy." Five months later the patient was readmitted with bleeding and with a history of having been overdue in her period two months before this. On vaginal examination a bluish tumor, the size of a hen's egg, was found on the posterior surface of the vaginal wall, just below the cervix. Microscopic examination of this mass suggested chorio-epithelioma. The Friedman test at this time was positive. In his comment, Linett (98) makes the statement that the hormone of the anterior pituitary lobe reappeared in the urine after a negative test had been obtained.

Comment The negative test, however, was reported six days after the mole had been passed and could easily have been negative either on account of the death of the mole or because it had been passed away. Five months had elapsed before the next admission, and another pregnancy could easily have intervened, in fact, there was a short period of amenorrhea in this interim period.

Chamorro (26) records negative tests in 3 cases of hydatidiform mole.

Shinoda and Shinoda (147) record a case of typical chorio-epithelioma with negative hormonal reaction, and state that occasionally the Aschheim-Zondek reaction does not appear in normal pregnancy (seemingly not recognizing the fact that the small discrepancy in the Aschheim-Zondek test has been attributed by practically all observers to laboratory error or to the use of an improper animal). They also state that in a few cases the Aschheim-Zondek test has been negative in the presence of hydatidiform mole.

Comment They seem to ignore the fact that there can be "missed molar abortion" just as there is "missed abortion," and that obviously in this con-

(58) noted that The chorionic gonadotropic hormone is distinct from the first group in that it occurs in large amounts during pregnancy in association with chorionepithelioma and hydatidiform mole and in men with certain testicular tumors. It presents many biologic differences from the anterior pituitary hormones. For instance in the immature rat ovary it induces follicle growth and luteinization but the resultant histologic picture is characteristic. Instead of the large numbers of small closely packed corpora lutea and atretic follicles which result from the administration of anterior lobe extracts there are large corpora normal developing follicles and larger or smaller cysts lined with lutein cells. Moreover these changes are believed to be due not to the chorionic hormone alone but to its action along with anterior pituitary factors already present in the normal animal. Thus is shown by the fact that in hypophysectomized rats the chorionic hormone fails to stimulate follicle development and only directly affects the ovarian interstitial cells. In spite of the repeated statement that the chorionic hormone is made up of two different elements (Novak) no sound experimental evidence such as has been advanced for the anterior hypophyseal substance is as yet available. The origin of the chorionic hormone is not known for a certainty. In many ways it seems to fulfill the requirements for a luteinizing factor from the anterior hypophysis but on the other hand there is good reason to believe that it may be produced by the placenta and by certain newgrowths. Until the final answer is obtained it is very important that these two groups be kept distinct and this is especially true in dealing with clinical problems. There are not only many biologic differences between the two types of hormones but they also occur under very different physiologic and pathologic conditions.

During the past three years there have been numerous comments attesting the value of the biological pregnancy test as a diagnostic medium in both hydatidiform mole and chorio-epithelioma. De Geus (39) contends that in doubtful cases it is safer to rely on the Aschheim Zondek test for diagnosis than on the clinical findings. Lazard and Kliman (92) say. Our cases emphasize the importance of the Aschheim Zondek test for the early diagnosis of chorio-epithelioma. Lazarus Barlow (94) details 4 cases to illustrate the value of the Friedman test, (1) in the early diagnosis of hydatid mole or chorio-epithelioma (2) as a criterion of the complete removal of a mole or the presence of a subsequent chorio-epithelioma and (3) as evidence of secondary

deposits after hysterectomy for chorio epithelioma. Mathieu and Palmer (112) remark. Before the discovery of their pregnancy test by Aschheim and Zondek the diagnosis of chorio-epithelioma usually rested on the presence of profuse uterine bleeding extensive metastases and the findings of the tissue in the curettage. Now however since chorio epithelioma can be demonstrated by a positive pregnancy test it appears that the diagnosis can be made early even before metastasis takes place and with a considerable degree of certainty by the judicious use of the Aschheim Zondek or the Friedman test. Caldwell (24) states that Major importance must now be accorded to the pregnancy urine test. Davis and Brunschwig (37) referring to the biological pregnancy test say the character of the growth itself has provided us with the best diagnostic aid for the recognition of the primary tumor and a warning signal for possible recurrences and metastases. Feiner (56) is of the opinion that The clinical value of the Aschheim Zondek test in doubtful cases during the dormant period cannot be too strongly emphasized. Malzewski (101) believes that the Aschheim Zondek test is as important for the diagnosis of chorio epithelioma as the Wassermann test is for lues. Gough (72) attributes his one fatality to the delay in diagnosis so common before the use of the hormone tests.

Comment. And so on and on the contributors even the few who strike a morbid note with regard to the value of the test and those who have procured negative tests in the face of existent mole or chorio epithelioma all concede that the biological pregnancy test is probably the greatest factor in the diagnosis of chorio epithelioma and hydatidiform mole extant at the present time.

Bizarre and irreconcilable reports. The greatest pitfall however in diagnosis is misconception of the biological pregnancy test. There are a few bizarre and irreconcilable reports presented. Schumann and Voegelin (145) make the statement that even this diagnostic factor may fail as will be shown in the history of the case here reported. Their patient complained of vaginal bleeding backache and bearing down sensations which began about two weeks before admission. (The patient failed to inform us and it was not until after her death that it was learned that the miscarriage described (5 years before) was really an hydatid mole.) A diagnosis of incomplete abortion and retroversion was made and curettage appendectomy and Baldy Webster suspension of the uterus were performed. The curettages showed greatly degenerated placental

undertake serious interference (roentgen ray and operation) should by no means be made because of a single positive reaction," nor should errors in diagnosis be made because of one negative report (111)

In many of the cases reported (75, 92, 98, 145, and 161) there were other incongruities. For example, the case of Ehrhardt and Kramann (47) causes one to wonder. With the symptoms of ectopic pregnancy and a positive Aschheim-Zondek reaction laparotomy was done, but no pregnancy was found. The only thing found was a corpus-luteum cyst. One day after the operation the Aschheim-Zondek was still positive, but eight days later it was negative. They think that the occurrence of a positive reaction in the presence of a persistent corpus luteum renders this reaction of less value in the diagnosis of suspected tubal pregnancy and should be kept in mind in dealing with an early case.

Comment So many errors have been made in the microscopic diagnosis of chorio-epithelioma that it might be safe to say that in these incongruous reports the error may have taken place in the pathological study.

So much for the qualitative tests

Quantitative estimation of chorionic gonadotropic hormone "That the demonstration of an increased excretion of gonadotropic substance in the urine is important for early diagnosis of chorioneplithelioma is now acknowledged unanimously in the literature. Physicians are obliged to have the urine of every woman assayed for this factor. While the increased excretion of gonadotropic principle usually ceases about one week after delivery of a normal placenta, it may continue for from four to twelve weeks following discharge of a mole. In case histologic examination of the curettage material is doubtful, which may sometimes be the case, assay of the urine for gonadotropic factor is of greater significance in the diagnosis than the histologic examination. In case the pregnancy test has become negative following discharge of the hydatidiform mole, the patient's urine should be assayed at monthly intervals," Zondek (178). A partial summary of Zondek's (178) paper on "Gonadotropic Hormone in the Diagnosis of Chorioneplithelioma" is as follows (1). In the pathological placenta (hydatidiform mole, chorio-epithelioma) the production and excretion of gonadotropic substance may be immensely increased. The hormone appears in greatly increased amounts in the blood, urine, and spinal fluid. (2) A diagnosis of hydatidiform mole cannot be considered as estab-

lished unless, in repeatedly performed examinations, at least 200,000 mouse units of luteinizing principle are found in the urine and, in addition, a positive luteinizing reaction is obtained from the spinal fluid, preferably diluted. It is necessary to rule out toxemia of pregnancy, as in this condition large amounts of luteinizing substance are also excreted in the urine. (3) If the pregnancy test still remains positive six weeks after the discharge of a hydatidiform mole, and if the content of gonadotropic substance in the urine has progressively increased in this period, it suggests a diagnosis of chorio-epithelioma, particularly if a positive reaction is also found in the spinal fluid.

Evans (50), in 1935, made these comments (quoted from abstract) "Extraordinary titers are given with the hydatidiform transformation of the chorion, and in chorioneplithelioma amounts of from 100,000 to 520,000 mouse units per liter have been reported. The complete removal of the mole or malignant tissue usually leads to rapid disappearance of the hormone, but a few cases have been reported in which the hormone lingered unduly." Fluhmann (58) is of the firm belief that positive pregnancy tests, especially tests increasing in intensity some weeks or months after a normal pregnancy or hydatidiform mole, are very important in establishing a diagnosis of chorioneplithelioma. Ehrhardt (46) concludes that when there is a high titer of the luteinizing hormone which falls after the removal of hydatidiform mole, then rises again, the presence of chorioneplithelioma is indicated. Phaneuf (131) stresses the point that a progressive increase of gonadotropic substance in the urine six weeks after the expulsion of a mole suggests chorioneplithelioma. Ruzicka (141) thinks that the quantitative hormone values in the blood and urine have a deeper significance than is indicated in the literature.

Various methods of quantitative estimation Several attempts have been made to estimate quantitatively the amount of hormone by some other method than the Aschheim-Zondek test with the use of mice. For example, Schoeneck (144) attempted to determine the minimum amounts of urine, at various stages of pregnancy, required to produce positive Friedman reactions. With such normal standards established, he says a quantitative Friedman test is made available. His technique is as follows: "Nonpregnant does weighing at least 1,500 gm and between sixteen and eighteen weeks of age were used. All animals were of the same or similar breeds and were obtained from the same source. Fractional intravenous injections of known pregnancy urines were made. Two to six rabbits were used for each

dition the test would be negative since there is no living chorionic tissue present. Their report of negative hormonal reaction in the presence of malignant chorio epithelioma is quite doubtful. Apparently they did not prove that their case was one of chorio epithelioma. In the first place the sedimentation rate reported by them was normal. In the second place their clinical diagnosis was probably malignant chorio-epithelioma and microscopically they found in their tumor only syncytial cells and no Langhans cells and no chorionic cell. One should view their report with skepticism since it appears that their case is not one of proved chorio epithelioma.

It is hoped that the reviewer's ideas will not be thought pragmatic but will be looked upon rather as efforts to explain what appear to be irreconcilable reports.

Warnings regarding interpretation of qualitative test. A note of warning in the interpretation of the test for chorionic gonadotropic hormone has been struck by a few authors [Gough (72) Mathieu (111) Fluhmann (58) Zondek (178) Mandelstamm (102)]. To illustrate that a negative pregnancy test does not rule out the presence of mole Mathieu (111) describes a condition called missed molar abortion. In such a case a hydatidiform mole would be entirely separated from its uterine attachment still lying in the uterus but absolutely separated from all circulation. This compares in a manner to missed abortion in which the placenta and the fetus are still lying in the uterus absolutely unattached and in which there would be a negative Aschheim Zondek test. Brindeau Hinglais and Hinglais (17) speak of the same condition as dead mole and present 2 such cases. Jeffcoate (83) reports an almost identical case. Brews (15) mentions 2 such cases with retained fragments of benign mole in which the pregnancy reaction was negative.

Gough (72) wisely points out. The hormone studies especially the Aschheim Zondek test and its modifications are invaluable in the study of chorioneplithelioma. So important is this test that skepticism regarding many of the older reports is aroused particularly those recorded spontaneously cures and diagnoses based entirely on the microscopic examination of curetted material. Similar reports today would be made with reluctance except when substantiated by biologic tests because the presence of living chorion in any part of the body is manifested by the excretion of excessive quantities of anterior pituitary like hormone. In normal pregnancy an error of 1 or 2 per cent occurs in these tests and at times nonpregnant women may excrete an excessive

amount of the hormone. Controversy arises when the histologic structure and the Aschheim Zondek test do not coincide. The biologic test should be valued but the absence or presence of an excessive quantity of the hormone in a single specimen of urine should not outweigh clinical judgment. A repeated positive reaction without other symptoms has demonstrated the great value of this test and a single negative report does not exclude malignancy. Persistence of a positive reaction, even though it is slight is far more suggestive than a single one with high hormone content. Blindly accepting the fact that the test often remains positive for several months after the expulsion of a mole may lead to disaster.

Mathieu (111) in discussing the use of the Aschheim Zondek test in relation to hydatidiform mole and chorio-epithelioma states. In the first place one must remember that an incidence of laboratory error up to 2 per cent is to be expected. We should know that with the use of immature rabbits a false negative test is more probable than a false positive test. Therefore a negative test which does not agree with the clinical picture might be false and another test should be made. Extreme care being taken in collecting and labeling the urine specimen and in the technique of the test. I cannot believe that in the presence of chorio-epithelioma it is possible to find an Aschheim Zondek test fluctuating from negative to positive. I feel that we can rightfully conclude that as long as there is living chorionic tissue present the Aschheim Zondek test will be positive and if there is no living chorionic tissue present the Aschheim Zondek test will be negative. (Rarely the lesion may be so small as not to produce sufficient hormone to make the test positive.)

Fluhmann (58) explains. It must be recognized that there are some limitations to the usage of the test and the results must be clearly interpreted in the light of the patient's history. For instance chorionic hormone may persist in the blood and urine for as long as six weeks after the evacuation of a hydatidiform mole and therefore may not necessarily imply that an incomplete operation has been performed or that a chorioneplithelioma is present.

Zondek (178) warns against misinterpretation of the test because of a new pregnancy which may develop soon after a mole. He says. There is always the danger of interrupting a normal pregnancy or even of extirpating the pregnant uterus of a healthy young woman. And Mandelstamm (102) warns against pitfalls due to misconception of the test when he says, 'Too rapid decision to

undertake serious interference (roentgen ray and operation) should by no means be made because of a single positive reaction," nor should errors in diagnosis be made because of one negative report (111)

In many of the cases reported (75, 92, 98, 145, and 161) there were other incongruities. For example, the case of Ehrhardt and Kramann (47) causes one to wonder. With the symptoms of ectopic pregnancy and a positive Aschheim-Zondek reaction laparotomy was done, but no pregnancy was found. The only thing found was a corpus-luteum cyst. One day after the operation the Aschheim-Zondek was still positive, but eight days later it was negative. They think that the occurrence of a positive reaction in the presence of a persistent corpus luteum renders this reaction of less value in the diagnosis of suspected tubal pregnancy and should be kept in mind in dealing with an early case.

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test The animals were laparotomized forty eight hours after the injections Corpora hemorrhagica or fresh corpora lutea were the criteria for a positive reaction This paper is interesting and valuable

Melot (117) mentions the Friedman Brouha reaction in which the test animal is a rabbit The results are determined by the minimal amounts of urine injected

In the Brindeau Hinglais and Hinglais method (16 17 18) quantitative estimations of the hormone are made by the intravenous injection of measured quantities of the patient's blood serum into rabbits (animals weighing about 2 kilos are advised) By estimating the quantity of hormone after the passage of a mole these authors developed curves showing the hormone content of the serum In their opinion the prolonged period of hormone elimination and the consequent persistence of a pregnancy reaction does not necessarily indicate malignant evolution of the molar rests They make their diagnosis on the increase or decrease in quantity that is the quantity of hormone decreases when chorio epithelioma is not developing and increases when chorio epithelioma is developing In the experience of these authors reappearance of the hormone after its complete disappearance has never been observed They cite cases to illustrate the value of their curve and their work has been substantiated by other authors (6 118 161 162)

Misconceptions and irreconcilable reports Zondek (178) attempts to establish the dictum that a gonadotropic hormonal content of the urine of over 200 000 mouse units is diagnostic of hydatidiform mole Zondek for instance states suspicion of the pathologic alteration of pregnancy may justifiably occur if the morning urine contains more than 50 000 mouse units per liter of the hormone Aschheim declares values of more than 100 000 mouse units per liter point to the presence of hydatid mole with great probability (32) That these 2 authors are a bit too arbitrary is shown by the work of Fluhmann (59) Evans Kohls and Wonder (52) and Palmer (126) For example Fluhmann (59) reports a case of hydatidiform mole which actually showed smaller amounts of the hormone in the urine than one usually sees in normal pregnancy This patient died in about two months with extensive metastases The histologic picture showed very few syncytial cells and a preponderance of Langhans cells

The mere presence of an excessive amount of hormone or an increase does not positively signify abnormality for in 1937 Evans Kohls and

Wonder (52) submitted a very interesting report Conadotropic Hormone in the Blood and Urine of Early Pregnancy in which they say It is a surprising fact that there are relatively few quantitative estimations of the gonadotropic hormone in the urine of normal pregnancy attention having been directed mainly to the remarkable diagnostic reliability of the Aschheim Zondek test

The chief cause for ignorance of hormone levels in normal pregnancy is undoubtedly the excessive cost of sufficiently accurate titrations In their studies of normal pregnancy Evans and his co-workers (52) found that the amount of gonadotropic hormone excreted per day was low during the last two thirds of pregnancy as compared with

the invariable existence of an exceedingly steep and high hormone peak at a time which is quite accurately one month from the beginning of the first expected but missed menstruation and that this peak must be recognized as a normal phenomenon in all studies attempting to relate high hormone levels with pathological insignia

Comment All of which means that in studying quantitatively the excretion of the chorionic gonadotropic hormone with relation to hydatidiform mole and chorio epithelioma one must take cognizance of this fact

Palmer (126) also warns against the dogmatic statement that an extremely high level of chorionic gonadotropic hormone means hydatidiform mole or chorio epithelioma especially during the first three months of pregnancy since he found a value occasionally reaching more than 1 000 000 mouse units in twenty four hours about the sixteenth day of pregnancy He thinks however that if the pregnancy has definitely passed the first trimester an unusually high excretion of the hormone is in all probability of definite diagnostic value

Tasovac and Mirjanic (161) found the Brindeau Hinglais test positive after the discharge of a mole Twenty two days later the test was negative They state however that on the fourteenth day after the mole was passed the patient began to bleed Curettage was done and a chorio epithelioma was found The pregnancy test the following day was negative These authors state that their case was one of atypical chorio epithelioma and that it could not be determined whether the chorio epithelioma was benign or malignant (They appear to be some incongruities and inconsistencies in this case) The authors content however that a constantly negative biological reaction is proof that there is no active chorionic tissue

In the case reported by Hajek and Bareuther (75), qualitative and quantitative hormone analysis on infantile mice and rabbits gave negative findings in spite of the histologically demonstrated brain metastasis of malignant chorio-epithelioma. These authors could not explain this discrepancy.

Ruzicka (141) reports that quantitative studies of the gonadotropic hormone in the urine of his patients with chorio-epithelioma and hydatid mole failed to show such high determinations as have previously been reported. The average figures were from 30,000 to 50,000 mouse units. He describes 1 case of hydatidiform mole progressing to chorio-epithelioma in which the uterus and cystic ovaries were removed and in which the pregnancy reaction in the urine was negative even though lung metastases existed. (It is not stated whether this reaction was corroborated by other tests.) He concludes, nevertheless, that the Aschheim-Zondek test is of extreme value in diagnosis and prognosis.

Comment. In order to obtain information concerning apparently moot questions relative to the biological pregnancy tests, and in order to attempt to clear up some irreconcilable reports found in the literature, i.e., (1) fluctuations from positive to negative in known chorio-epithelioma, (2) negative tests in apparently proved cases, and (3) negative tests intervening between transition of mole to chorio-epithelioma, I submitted a series of 3 questions to Herbert M. Evans, University of California Institute of Experimental Biology, Berkeley, Allan Palmer, University of California Hospital, San Francisco, C. Frederic Fluhmann, Stanford University Hospital, San Francisco, Charles Mazer, Philadelphia, Raphael Kurzrok, New York, George Van S. Smith and O. Watkins Smith, Fearing Research Laboratory, Free Hospital for Women, Brookline, Massachusetts, and Walter Schiller, Cook County Hospital, Chicago—all American investigators who have international reputations in the biological pregnancy test field. The following is the letter with the questions.

"I am preparing a review of the literature on the subject of hydatidiform mole and chorio-epithelioma covering the last three years, for SURGERY, GYNECOLOGY AND OBSTETRICS. In reading this literature, I have found that there seems to be much misconception concerning the amount of chorionic gonadotropic hormone found in the urine of the woman who harbors a mole or chorio-epithelioma, and there also seems to be considerable misconception as to the origin of chorio-epithelioma. Many men seem to have the opinion that (excluding teratomatous tumors) chorio-epithelioma just springs up out of the air, or is literally created.

"There also appears to be, what I think is a misconception in the fact that many men believe that

there can be a period between the initial pregnancy or mole and the chorio-epithelioma in which the Aschheim-Zondek test would be negative. This, of course, is beyond my comprehension. I can't believe that if there is sufficient living chorionic tissue remaining following a mole, so that it can develop into a chorio-epithelioma, there could be a period in this evolution in which the Aschheim-Zondek could be negative. In other words, I believe that this tissue must be alive in order to develop into a chorio-epithelioma, and that if it is alive, there must be a positive Aschheim-Zondek reaction in the urine. This, of course, brings up the point as to how much living chorionic tissue it takes to show a positive Aschheim-Zondek test in the urine.

"Will you be so kind as to give me your opinion on these points?

"1. Do you believe that great stress should be placed on the high content of prolactin B in view of the fact that we know that some normal pregnancies show enormous quantities of prolactin B and that numerous cases have been published that show a low quantity of prolactin B in cases of proved hydatidiform mole or chorio-epithelioma?"

"2. Have you any concept of how much living chorionic tissue is required to produce a positive Aschheim-Zondek test?"

"3. Do you believe that there could be sufficient living chorionic tissue following a pregnancy or mole to develop into a chorio-epithelioma without its producing a positive Aschheim-Zondek test?"

The answers are as follows:

Herbert M. Evans (51), University of California Institute of Experimental Biology: "I do not feel able to answer with any finality the three questions in your letter of February 4, but I am very glad to make the effort because I think such discussions clarify the issues involved. You may quote me as saying that I do not think the questions which you ask can ever be satisfactorily settled until much more exact (quantitative) studies are done on the urinary chorionic gonadotropic hormone than have been done hitherto. Quantitative tests take several groups of animals, from three to six animals in every group, and most laboratories cannot afford the outlay in these valuable young animals of known age.

"I will try to answer your interesting questions.

"1. I still believe that great stress should be put on the quantitative content of the urine in chorionic hormone (you will note that I do not use the term Prolactin-B). Simultaneously with Brown and Venning, and about a year ago, we showed that normal pregnancies have a sudden high peak of urinary hormone one month after the first missed period (*J Am M Ass*, 1937, 108:287). I believe that the clinical history will not permit confusion as to whether a normal

pregnancy is present I am frankly surprised at your statement that numerous cases have been published that show a low quantity of *Prolan B* in cases of proved hydatidiform mole or chorio epithelioma. I would like to look up these cases if you could jot down the references. Another comment I would like to make here is that an increasing chorionic hormone content or one which does not decrease is perhaps more important than the exact quantitative level.

2 The amount of living chorionic tissue required for a positive Aschheim Zondek test can not be massive because such tests are given about ten days after actual conception and embryologists like Streeter at Baltimore could compute just how much chorionic tissue such a young ovum possesses.

3 I do not believe that there could be sufficient living chorionic tissue following a pregnancy or mole to bring about the formation of a chorio-epithelioma without producing a positive Aschheim Zondek test.

Finally I would like to say that in my opinion the fact that Aschheim Zondek tests are not properly standardized—the fact that some men do them with mice some with rats and some with a single intravenous rabbit injection—could lead to some things in the literature which I think frankly are untrue—that is are myths. I believe strongly with you that the Aschheim Zondek test is never actually negative between a pregnancy and the malignancy which results from it but it is possible that for a while it is so low that precipitation of the urine by alcohol or acetone would be essential to detect the hormone. We are trying to do this kind of thing here in Berkeley.

Allan Palmer (126) University of California Medical School. In answer to your enumerated questions.

(1) The highest amount of chorionic gonadotropic hormone reported for any case of chorion epithelioma or mole has not exceeded the highest amount of the same hormone reported excreted in the normal pregnancy during the first trimester. If a pregnancy is definitely beyond the first trimester then I think some value can be attached to excessive amounts of chorionic gonadotropic hormone excretion. I don't know where this level is but am quite certain that a value well over 100,000 units (rat or mouse) per day would be definitely excessive for a normal pregnancy of longer than four months duration. In this case of course x-ray examination should be just as helpful. The one finding that should be stressed however is that when the urinary content of chorionic gonadotropic hormone is high in nor-

mal pregnancy during the first trimester a positive pregnancy reaction on the spinal fluid has not yet been reported. Until such a finding is reported I think it is safe to state that a positive pregnancy reaction on a specimen of spinal fluid is diagnostic of pregnancy tumor. We have had one or two cases each in which the urinary chorionic gonadotropic hormone has been low and the spinal fluid positive for pregnancy, with resulting diagnosis chorioepithelioma. Also we have had at least one case of normal pregnancy in which the urinary chorionic gonadotropic hormone has been high and the spinal fluid negative.

(2) I have no concept of how much living chorionic tissue is required to produce a positive Aschheim Zondek test. I do believe that in view of known existing syncytial reactions with negative chorionic gonadotropic hormone tests that a physiological peculiarity of the tissue and not its quantity is responsible for the positive chorionic gonadotropic hormone test when present.

(3) No for reasons mentioned above.
C. Frederic Fluhmann (59) Stanford University Hospital. (1) I agree with your idea that the quantity of hormone present is not as important in the diagnosis of chorio-epithelioma as the fact that there is some hormone. However following a hydatidiform mole a gradually increasing amount of hormone in the urine is significant as it implies that there is an active process going on.

It is interesting to me that the analysis of a patient of the late R. A. Smith and T. Henshaw Kelly actually showed smaller amounts of hormone in the urine than one usually sees in normal pregnancy. This patient died in about two months with extensive metastases. The histologic picture showed very few syncytial cells and a preponderance of Langhans cells. I do not know that this has any bearing on the hormone production but it is at least suggestive.

(2) I have no idea as to how much living chorionic tissue is required to produce a positive Aschheim Zondek test.

(3) It is conceivable that such tissue may be present and yet produce amounts of hormone insufficient to give positive tests by the usual technique. However that is purely an opinion and is therefore worthless and the answer should await actual observation.

I do hope however that you will abandon the use of the indefinite term *Prolan*. It was originally employed at the time all gonadotropic hormones were believed to originate from the anterior pituitary gland but since we now think that chorionic tissue can produce one of these

the name 'Prolan' has become very confusing I like to use 'anterior pituitary gonadotropic hormone,' 'chorionic gonadotropic hormone,' and 'equine gonadotropic hormone'."

Raphael Kurzrok (89), New York "The problem that you propound is a very interesting one and one to which I have given considerable thought without coming to a very definite conclusion. My impression is that a chorio-epithelioma represents chorionic cells whose invasive powers have increased beyond the normal, possibly in an individual whose resistance to such an invasion has definitely been lessened. The relationship of the chorio-epithelioma to the Aschheim-Zondek Test can best be understood by a consideration of the relationship between the Aschheim-Zondek Test and the normal chorionic epithelium.

"We are not wholly in agreement as to the source of prolan A and B in the urine. Some evidence is beginning to accumulate that the A fraction may be a direct derivative of the anterior pituitary especially early in pregnancy. While on the contrary, the B derivative is most likely always chorionic in origin. Prolan A and B therefore represent a metabolic product of the chorionic epithelium and possibly the pituitary. We discover this hormone in the urine and label this a positive Aschheim-Zondek Test for pregnancy, but its presence in the urine depends on several unknown factors (1) How much is produced? (2) How much is metabolized? (3) How much is broken down? (4) How much is stored? (5) How much is 'free' and how much is 'combined'? (6) The height of the renal threshold or the level in the circulating blood? and (7) How much is excreted?

"Concerning all these factors we only know something about the latter two, but even the last two factors show very extensive variation between patients, and during the various phases of the pregnancy in the same patient, and the amount varies from pregnancy to pregnancy in any given patient.

"Similarly, the same difficulty applies to the chorio-epithelioma. Remember that we do not know at the present time whether prolان represents a defensive process on the part of the organism or an attack on the part of the chorio-epithelium. The amount found in the urine is no criterion of the amount actually produced by the chorionic cells. It gives us some light but not enough light. Hence we have seen chorio-epitheliomas with very little prolان in the urine and normal pregnancies with amounts large enough to suspect hydatid mole. Hence, no great stress

should be placed on the quantities of hormone found unless they are extraordinarily high.

"The smallest amount of chorionic tissue that I have seen that gives rise to a positive Aschheim-Zondek Test was a nodule about 5 mm in diameter.

"I believe that a chorio-epithelioma may begin its formation without the external manifestation of prolان A and B in the urine, for the simple reason that so many factors could influence its appearance in the urine at any one time. Sooner or later huge amounts will be spilled over especially when the growth is extensive enough.

"I hope that I am not too didactic in this opinion for I feel that we as yet know very little concerning the total metabolism of these pituitary-like hormones."

Charles Mazer (114), Philadelphia "No individual has had a sufficient number of well-studied cases of hydatidiform mole and chorio-epithelioma to justify an authoritative answer to your questions. I shall answer your questions to the best of my ability and personal experience.

"(1) The quantity of prolان present in the urine of pregnant women varies indeed with the individual but more so with the term of pregnancy. A positive rabbit test with a total of 4 minims of urine is usually obtained during the third month of normal pregnancy. In order to establish a diagnosis of hydatidiform mole, 1/12 of this quantity or a total of 1/2 of a minim should give a positive rabbit reaction. I have never seen less than 4 minims of urine to render a positive rabbit pregnancy test at any time of pregnancy, nor have I seen, in my limited experience of proved hydatidiform mole and chorioepithelioma, lower levels of Prolan-B than those present during the height of prolان excretion in normal pregnancy.

"May I add that one rabbit unit is equal approximately to six rat units, unless the more sensitive postpartum rabbit is employed as a test animal.

"(2) I have no concept of how much living chorionic tissue is required to produce a positive Aschheim-Zondek test. I am sure, however, that in some cases there is a period before the development of a chorioepithelioma when the Aschheim-Zondek test is negative. This would imply that at that period there is insufficient chorionic tissue to produce a positive Aschheim-Zondek reaction.

"(3) The answer to question No. 3 is as above. "May I add, whether one uses the rabbit, rat or mouse for test purposes, it is the quantitative estimation of prolان-B, repeated at regular intervals, that counts in the diagnosis and prognosis

of chorionepithelioma and that the use of the 24 hour output rather than the morning urine alone should be the basis of computation.

George Van S Smith (150) Fearing Research Laboratory Free Hospital for Women Brookline Massachusetts I was glad to get your letter of February 4th although your questions are difficult to answer with any degree of final assurance or accuracy I turned your letter over to Mrs Smith and she wrote out her reactions with which I agree entirely and which I am enclosing as a separate small thesis As a matter of fact we ourselves have done only a small amount of work on mole and chorio-epithelioma so that we hardly feel in a position to give a final opinion

You probably have noted that Dr Dougal of Manchester England has reported two cases of primary ovarian chorio epithelioma that seemed to spring out of the air as it were and of course such has been the case in the human male We have done hormonal assays on a few cases of male chorio- (reference *Proc Soc Exptl Biol & Med* 32 847 1935)

The finding of a period between the initial pregnancy or mole and the chorio-epithelioma in which the Aschheim Zondek test is negative is undoubtedly due to a matter both of technique and amount of tumor After all in very early pregnancy we fail to get positive tests although we know that chorionic tissue is present and the same holds true apparently in the initial stages of chorio Undoubtedly if we could extract satisfactorily a sufficiently large amount of urine or serum we could identify APL (anterior pituitary like hormone) in the very earliest stages of chorionic growth

Some months ago Dr James L Huntington of Boston came to me with a closely related problem A patient had had a miscarriage and was bleeding Curettage was negative By the Friedman test to cc of morning urine gave a marked positive reaction He wanted to know what to do I advised Aschheim Zondek tests but if they could not be done a repeat Friedman test using 10 cc of urine and $\frac{1}{2}$ cc of urine in two different rabbits The $\frac{1}{2}$ cc gave a marked positive and examination of the removed uterus showed a chorio-epithelioma in its wall less than 1 cm in diameter In other words although a chorio may fail to give a diagnostic positive in its very earliest stages it will certainly give a characteristic positive before it gets beyond easy clinical control

To answer your points specifically (1) I do believe that stress should be placed on the high content of APL not only from our own experience

and that of others but because I believe that those cases reported as having shown a low quantity of APL probably were not studied carefully enough and by thoroughly approved methods—even though methods still need lots of improvement As Mrs Smith points out normal pregnancies show enormous amounts of APL for less than three weeks during the first trimester and thereafter the amounts are comparatively low except in toxemia in the last trimester Another point in this connection is that sometimes APL does not appear in the urine although there is plenty in the serum hence we believe in quantitating serum APL and I wonder if those reported cases of low APL with proved mole or chorio may not have had only urinary assays

In answer to number 2 I would say that the smallest amount of chorionic tissue required to produce a routine positive Aschheim Zondek test is that amount found in the uterus of early pregnancy three or four days to two weeks after a missed period More I cannot commit myself to

(3) I do think that there could be sufficient chorionic tissue following pregnancy or mole to develop into a chorio- without producing a positive Aschheim Zondek test by the methods extant—but that certainly if chorio- were getting under way a repeat test in the matter of less than a month would almost undoubtedly give a positive

O Watkins Smith (152) Fearing Research Laboratory Free Hospital for Women Brookline Massachusetts (1) A matter of quantitative determinations and repeated tests At about the time of the second missed period in normal pregnancy there is a peak in the level of APL in both serum and urine with values frequently as high or higher than those found in mole or chorio-epithelioma We always test serum in preference to urine since unless a 24 hour volume of urine is collected urine analysis gives only a qualitative test In normal early pregnancy there is only a very short period of time when enormous quantities of APL are found—not more than two or three weeks at the most In mole or chorio- the amount increases as the disease progresses An example best illustrates the point

Mrs 1 B came into the hospital station and with a history of miscarriage 2 5 months before It was a question of chorio or early pregnancy The serum was tested for APL in amounts varying between 2.0 cc and 0.03 cc All of the tests were positive The report was sent in with the recommendation that another sample be analyzed in two or three weeks If normal early pregnancy the APL should be down by that time Three weeks later another blood specimen was called and the same amounts of serum test 4 The smallest amount which gave a positive

Aschheim-Zondek test at this time was 0.5 cc. It was therefore apparent that this was a case of early pregnancy rather than mole, a diagnosis which has since been confirmed clinically¹.

"(2) and (3) Here again it is a matter of repeated assays and quantitative rather than qualitative tests for APL, and the use of serum by preference unless 24 hour specimens of urine are available. In early pregnancy prior to the second missed period, one frequently is unable to get a typical positive test for APL with either serum or urine, not because the gonadotropic principle is absent but because it is present in only small amounts. We have tested for APL in the serum and urine of women throughout the period of conception and early pregnancy (see *N E J Med*, 215, No 20, 908-914, 1936). Up to the sixth week of pregnancy, even when testing with extracts of very much larger amounts of urine or serum than would ordinarily be used in a routine Aschheim-Zondek test, we frequently find only an FSH (follicle stimulating hormone) effect in the ovaries of the test animals. We know that small amounts of APL give this reaction and feel certain that the failure to get a typical Aschheim-Zondek in these instances is due to dilution rather than absence of the chorionic gonad-stimulating hormone, since a failure to find anything more than a follicle ripening effect up to the 34th day of pregnancy may be followed on the 36th day by the appearance of a typical positive Aschheim-Zondek. Moreover, half the amount of urine which gives a typical positive AZ on the 36th day will give only follicle ripening. The same thing would naturally apply to very early chorio-epithelioma. Undoubtedly, as long as there is any living chorionic tissue present APL is being produced, but quite possibly in such small amounts that it cannot be identified as such in the serum or urine even when large amounts are extracted. The only solution, therefore, is repeated follow-up tests on a suspected case. As the disease progresses, if it is present, APL will increase until finally a typical positive test will appear. In following a case in which hysterectomy has been done for the removal of a mole or chorio-epithelioma, it must be remembered that FSH in the serum and urine is a typical finding after hysterectomy. It is also to be remembered that occasionally one gets a typical positive AZ test from the urine of a menopausal patient (and even sometimes in a normal menstrual cycle). The fact that small amounts of APL will give only an FSH effect, together with the fact that large amounts of pituitary FSH will produce corpora lutea, makes it doubly important that

repeated quantitative tests be performed in order to ascertain whether or not increasing amounts of the chorionic gonadotropic material are being produced."

Walter Schiller (143), Cook County Hospital, Chicago, Illinois "The questions you ask are difficult to answer on the basis of our present knowledge, especially the second and the third questions.

"The first question can be answered in the affirmative. Great stress should be placed on the high content of prolactin B, especially in non pregnant women. If the woman later than six weeks after abortion or delivery has not only a positive AZ test, but a test which is twenty or thirty times as positive, she doubtlessly is very suspicious for a mole or chorioepithelioma. The time factor plays a great rôle. If the Aschheim-Zondek test is positive in the twenty times diluted urine, it is 100% convincing for a chorio-epithelioma or mole in a non pregnant woman, but 90% probable only, in a pregnant woman. I would not fail to make the AZ test in the spinal fluid of suspicious cases. As advised by Zondek, the positive test in the spinal fluid definitely ascertains a mole or chorionic epithelioma.

"Questions two and three run parallel with the problem as to whether a carcinoma originates from one cell or from a group of cells. For the squamous carcinoma of the cervix, I hold it more likely that it originates by carcinomatous transformation of a group of cells, but I cannot deny the possibility supported by numerous prominent authors, for instance by Fischer-Wasels, that carcinoma may originate from one cell. This holds likewise for chorionic epithelioma.

"I feel that I have to accept the possibility that chorionic epithelioma or mole can develop from one chorionic cell remaining after pregnancy or abortion. Such a cell may live latent and dormant for a very long time, for many months or several years. This possibility can be proven by recurrences of carcinomas many years after operation. Whether one single cell or even a small group of cells can cause a highly positive prolactin B test can neither be proven nor denied with our present knowledge.

"In normal pregnancy at the beginning, the production of prolactin B is formed by the pituitary. The anterior lobe of the pituitary contains no prolactin at all at the end of the pregnancy, as demonstrated by Philip, the placenta itself producing the large amount of Prolactin B.

"What are the conditions of the moles? It may be at the beginning the mole stimulates the pituitary to produce the prolactin and when pro-

gressing produces the prolactin itself. These conditions have to be investigated.

There is also the following possibility. May be the overproduction of prolactin by the pituitary is the primary factor and this overproduction as a pathologically strong stimulus is responsible for the transformation of the latent chorionic cell into a malignant neoplastic cell. Finally numerous tumors of the ovary and the testicle have been classified as chorionic epitheliomata in view of the presence of syncytial masses and isolated cells which were identified as Langhans cells.

I fully adhere to the theory of Robert Meyer that there is a specific reaction with undifferentiated tissue to produce syncytial masses when ever the tissue comes in contact with blood. This reaction is regularly found in the placenta of early pregnancy and occasionally in teratoid tumors of the gonads. Whether this reaction which generally is accompanied by the presence of large quantities of Prolactin B in the organism is the cause or the consequence of the excessive prolactin has to be determined by further investigations.

Comment. All authorities agree on the value of the biological pregnancy test in the diagnosis of hydatidiform mole and chorio epithelioma. However there have been many misconceptions of the test: laboratory errors (2 per cent) too much reliance placed on a single test and clinical and pathological judgment found to be at variance with the test.

The chorionic gonadotropic hormone test is positive only if living chorionic tissue is present with two exceptions: (1) when the stored hormone has not been completely absorbed as when lutein cysts are present or during a period of five or six days following the removal of a chorio-epithelioma and (2) during the period of a week or so following mole if the nidus of chorionic tissue is too small to produce an amount of hormone sufficient to be detectable by method now extant. Although the existence of a nidus too small to produce a positive pregnancy test is a rarity, it probably explains those few cases reported in which there was a negative pregnancy test at some period during the transition of mole into chorio-epithelioma. If such a nidus exists it will not be long before it grows sufficiently to produce a positive test or as George Van S. Smith says the test will be positive before the disease gets beyond easy clinical control.

All authorities also agree that the mere qualitative test is not sufficient since the increasing amount of hormone associated with these diseases is only detectable by a quantitative assay. Nevertheless one should be aware of the fact that for two or three weeks at about the sixtieth day of normal pregnancy there is present an enormous amount of the hormone and in pursuit of mole and chorio-epithelioma with biological pregnancy tests one must be certain that normal pregnancy is not present.

At this point there arises a very important question which involves the vast majority of those who may be confronted by these diseases and that is the impracticability of the inexpediency or the actual impossibility of procuring quantitative tests. I know of no laboratory in the Northwest equipped to do this work and very few patients are able to pay the cost. When quantitative tests cannot be obtained and only qualitative tests are used one must be aware of the following facts: (1) the test is positive in the presence of living chorionic tissue which includes normal pregnancy, (2) the test is also positive in hydatidiform mole, chorio epithelioma or metastases of either disease, (3) the test may be negative in missed molar abortion in which case the mole is still inside the uterus but absolutely detached from it just as it would be in missed abortion, (4) the test may be positive for two months following the passage of the mole because of the presence of stored hormone in the body, (5) if a test is positive two months after the complete passage of a mole and normal pregnancy has been excluded, living molar tissue is still present or chorio-epithelioma has developed, (6) in the presence of lutein cysts after all living chorionic tissue has been removed the test will be positive until these cysts regress because the hormone is stored in them, (7) if the test is positive one month after the removal of the chorio epithelioma this is strong evidence of metastases, (8) absolute reliance should not be placed on one test and in questionable cases the test should be checked and rechecked also in all cases of apparent cure of hydatidiform mole and chorio epithelioma the test should be used freely and for a considerable period of time in order to diagnose recurrences, (9) the test should be used in all questionable diseases in which the element of chorio epithelioma might exist—this includes acute abdominal condition, mediastinal tumors and testicular tumors, (10) the spinal fluid gives a negative test with normal pregnancy and a positive test with mole or chorio epithelioma and (11) the biological test should overrule contrary clinical and pathological findings.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Ramsay, J., Thierens, V. T., and Magee, H. E.
The Composition of the Blood in Pregnancy
Brit M J, 1938, 1: 1199

The hemoglobin and bactericidal power of the blood against hemolytic streptococci, and the calcium, inorganic phosphorus, and phosphatase contents of the serum were determined in 101 women at the seventh month of pregnancy. The results may best be tabulated.

TABLE I—COMPOSITION OF THE BLOOD
IN PREGNANCY

| | Hemo- globin per cent | Calcium mgm per 100 c cm | Phos- phorus mgm per 100 c cm | Phos- phatase Bo- dansk's units | Bactericidal power against streptococci | |
|------------------------|--------------------------------|-----------------------------------|---|---|---|--------|
| | | | | | No growth | Growth |
| Means | 77.8 | 9.34 | 2.74 | 2.89 | 77 | 22 |
| Standard deviations | 12.3 | 1.25 | 0.55 | 0.95 | | |
| Ranges | 41-103 | 6-13.7 | 1.8-4 | 1-5.6 | | |
| Number examined | 95 | 96 | 97 | 97 | 99 | |

In the series, 7 of 95 women (7 per cent) were considered definitely anemic, and 18 (19 per cent) probably slightly so. The calcium level was less than 9 mgm per 100 c cm, which is believed to be abnormally low, in 37 of 96 women (39 per cent). The product calcium X phosphorus was 25, on the average. In 22 of 99 women whose blood was tested, the blood had failed to inhibit the growth of streptococci. One of these women developed pyrexia during the puerperium, fever also occurred in a woman whose blood had inhibited the growth at the seventh month.

A review of the literature indicates that the serum calcium and phosphorus fall and that the serum phosphatase rises gradually as gestation advances. No definite relation could be discerned between the state of health of the subjects during pregnancy, labor, or the puerperium, and the concentrations of hemoglobin, calcium, and phosphorus in the blood. Phosphatase values were higher in the patients who were ill.

DANIEL G. MORTON, M.D.

Nichol, R. W. The Etiology of Pregnancy Toxemia
J. Obst. & Gynaec. Brit. Emp., 1938, 45: 609

There is considerable evidence in support of the theory that toxemia of pregnancy is the result of hypertonus of the capillary vessels. This hypertonus is brought about by an increased sensitization to hormones of the pituitary gland, due to some overactivity or increase in the amount of the estrogenic hormones in the blood stream. The rapid improve-

ment which follows emptying of the uterus supports the view that the placenta may be the primary source of this imbalance. CHARLES BARON, M.D.

Petersen, E. Roentgenographic Diagnosis of Placenta Previa (Diagnostic radiographique du placenta prævia) *Acta obst. et gynec. Scand.*, 1938, 18: 275

Petersen notes that in recent years roentgenographic examination during pregnancy has played an increasingly important rôle, especially as this procedure makes it possible to avoid a vaginal examination in some cases in which a cesarean section may be indicated. In placenta previa it is especially desirable to avoid digital examination in establishing the diagnosis, as cesarean section, which is often the method of choice in treatment, makes the danger of infection from digital vaginal examination even greater than usual, moreover, this procedure may also induce a severe hemorrhage.

In 1935 Ude and Unger described a new method for the roentgenographic diagnosis of placenta previa, which was later designated by McDowell as a cystographic diagnosis of placenta previa. The method is a simple one. The bladder is emptied, and then 40 c cm of 12.5 per cent sodium iodide are introduced, a cystogram is made in the anteroposterior position. The upper border of the bladder appears as a concave line. When the placenta is normally inserted, the contour of the fetal head is seen in close contact with this concave outline of the bladder. However, if the fetal head is displaced by placenta previa, there is a clear zone at least 1 cm in width between the fetal head and the bladder.

The author has had an opportunity to use this method in 4 cases in which a hemorrhage suggesting the possibility of placenta previa occurred in the later months of pregnancy. In 2 of these cases, the cystogram showed the fetal head in close contact with the bladder outline, the diagnosis of placenta previa was thus excluded. Both patients were delivered normally at term without any sign of placenta previa. In the 2 other cases, the clinical symptoms were typical of placenta previa, and the cystogram confirmed the diagnosis, showing, in each case, a very definite clear area between the fetal head and the bladder outline. The position of the head in relation to the bladder outline showed that the placenta previa was of the central type. Cesarean section was done in these cases without a preliminary vaginal examination, and the diagnosis was confirmed. Both patients made a good recovery without complications.

The author also obtained reports of 4 cases from Christensen of Faaborg, in which the diagnosis of placenta previa was excluded by the cystographic method in 2 cases, and a diagnosis of partial placenta previa was made in the other 2 cases. The

cystographic finding in the 2 latter cases differed from those in the author's cases of central placenta previa in that the fetal head was in contact with the bladder on one side but definitely separated from it on the other side. Since then the author has seen a case of marginal insertion of the placenta in which the findings were similar. In this case the patient was delivered after rupture of the membranes.

From his own experience with this cystographic method and a review of the literature the author concludes that in a number of cases of hemorrhage in the last trimester of pregnancy the diagnosis of placenta previa can be excluded by this method. A definite diagnosis of placenta previa either central or partial or of marginal insertion of the placenta can be made with the aid of the cystogram. In partial placenta previa or marginal insertion of the placenta vaginal delivery with rupture of the membranes is indicated. If the cystographic diagnosis of central placenta previa is definitely established cesarean section is the method of choice with out a vaginal examination. It is important to use the full amount of opaque medium 40 c cm for the cystogram as with less the bladder does not fill properly and the cystogram may show a clear space between the fetal head and the bladder in normal cases while with more of the opaque medium the bladder outline is pushed upward.

WILLIAM M. MEYERS

Findley D. The Management of Placenta Previa. *Am J Obst & Gynec* 1938 36 6

An analysis of the management and results of 47 823 cases of placenta previa collected from world wide literature is presented.

The total series is divided into two groups: (1) those reported up to and including 1921 and (2) those reported from 1922 to the present time. The latter group shows a small but definite decrease over the former in both maternal and fetal fatalities. This decrease may be accounted for by: (1) a better understanding of the pathology and symptomatology of the condition which results in a greater number of early diagnoses; (2) a more universal appreciation of the dangers associated with untimely interference; (3) improved operative technique; (4) marked advancements in the field of anesthesia; (5) recourse to blood transfusions; and (6) more adequate maternity facilities.

A subdivision of these two main groups into cases in which the patients were delivered vaginally and cases in which they were delivered by the abdominal route is made and the mortality rates of each subgroup is shown. The incidence of cesarean section has increased from 6.07 per cent to 15.29 per cent during the past fifteen years while the maternal mortality rate has been reduced more than 50 per cent and falls well below the group delivered from below. A slightly decreased maternal mortality was also noted in patients delivered vaginally. This decrease is due chiefly to the avoidance of such

methods as accouchement force, the Braxton Hicks version and the use of vaginal packs and vaginal cesarean sections. Tables revealing the results of both abdominal and vaginal methods indicate that repeated prolonged or complicated manipulations greatly increase the risks to both mother and child.

Further tables show the methods used in the management of the various types of placenta previa. With but few exceptions the various procedures show an increase in the mortality rate in direct proportion to the degree of the obstruction.

Low cervical cesarean section, the procedure of choice in complete placenta previa and in other types with a closed cervix. In marginal or lateral placentas with a dilated cervix the method of choice is between artificial rupture of the membranes with forceps or spontaneous delivery of the fetus and internal podalic version.

Blood transfusions are invaluable aid in the presence of acute anemia and shock and shorten the period of convalescence. Suitable donors for all suspected cases should be available at the time of delivery. Transfusions should be resorted to more frequently.

The frequency of placenta previa, the incidence of the various types, parity, the period of gestation and the presentation and position of the fetus are discussed.

As most of these case reports were those of leading obstetricians and maternity centers throughout the world the resulting statistics do not give an accurate picture of the results obtained in general practice. It is fair to assume that the mortality rates in general practice would be much higher than in maternity hospital practice.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Phillips M. H. The Prophylaxis of Constriction Ring Dystocia. *J Obst & Gynec Brit Emp* 1938 45 638

The author calls attention to the fact that with normal uterine contractions during labor the pain is felt by the patient after the onset of the contraction and disappears before the uterus relaxes. It is his opinion that all on-contraction ring dystocias are preceded by what he calls colicky action of the uterus. This is characterized by very severe pains, occasionally intermittent in type, during which the patient complains bitterly and often struggles or strains. The pain as felt by the patient always persists until after the uterus has relaxed. These pains are not purposeful in that the pre-empting part does not advance and cervical dilatation does not ensue. If they are allowed to continue a on-contraction ring of the uterus results.

Prompt recognition of colicky pains and unremitting treatment of this condition then will prevent constriction ring dystocias.

The treatment of choice for these abnormal pains is the administration of adequate doses of heroin or

morphine Under the influence of these drugs the pains will cease and normal purposeful uterine contractions will ultimately result in a normal delivery of the infant

The cause of this condition is not known The author suspects "that it is most probably due to malfunction of the action of those endocrine glands which should ideally, steadily lead to progressive and even painless childbirth"

RONALD R. GREENE, M D

Courtois, J, and Balazuc, J A Study of 26 Cases of Symphyseotomy by Zarate's Method at the Obstetrical Center of Saint-Germain-en-Laye, with Late Results (*Étude de 26 cas de symphysiotomies à la Zarate pratiquées au Centre Obstétricale de Saint-Germain-en-Laye avec résultats éloignés*) *Gynecologie*, 1938, 37 81

Courtois and Balazuc report 26 cases of symphyseotomy at the Obstetrical Center of Saint-Germain-en-Laye In the period in which these 26 operations were done, there were 6,000 deliveries, with 125 abdominal cesarean sections—1 symphyseotomy to 5 cesarean operations Zarate's technique, which limits the division of the symphysis to about 3 cm, was employed, general anesthesia was used in every case Three of the patients were primiparas, and 23 multiparas As a rule this operation is not indicated for primiparas, but in the 3 cases in which it was done, cesarean section would have involved great danger to the mother In 2 of these cases the infants died as the result of meningeal hemorrhage, and in the third case the child had temporary facial paralysis

Among these 26 cases, there were 19 vertex presentations, 6 deliveries were spontaneous after symphyseotomy, 4 required pituitrin, and 9 required the use of the forceps There were 3 cases in which podalic version was done, including 1 of the former group after forceps had failed There were 2 cases of breech presentation, 1 case in which forceps were employed to change a brow presentation into a facial presentation, and 1 case in which a

vaginal cesarean section had been done In 7 cases incision of the cervix was also done

Six of the patients (and probably 2 others) had previously been delivered of stillborn infants because of contracted pelvis, in all of these cases a living infant was delivered after symphyseotomy Of 14 cases in which some procedure for extraction of the infant was necessary, such as the use of forceps, version, or vaginal cesarean operation, there were 9 in which symphyseotomy was done before the other procedure, and 5 in which it was done afterward because of failure to deliver the infant by the other procedure There were 3 fetal deaths, all occurring in the latter group There were no maternal deaths All but 2 of the patients were followed up for some time after the operation, and roentgenograms were made In 2 cases uterine prolapse occurred Four of the patients have had subsequent pregnancies, and all were delivered spontaneously, in 2 of these cases the infant was larger than in the previous pregnancy As a rule, in cases in which roentgenograms were made some time after the symphyseotomy, a clear space between the pubic bones, wider than normal, was demonstrated Normally measurements on the roentgenogram show the space between the pubic bones to be from 7 to 8 mm, most of the patients after symphyseotomy showed a clear space of 15 mm, but in some cases this space was little, if any, wider than normal

Symphyseotomy is indicated chiefly in minor degrees of pelvic contraction, when there is a conjugate diameter of 8 cm in flat pelvis, and from 8 5 to 9 cm in generally contracted pelvis in multiparas, in such cases it may be employed instead of a low cesarean section When a cesarean section is contra-indicated because of the condition of the mother, a prolonged labor, or the presence of infection, symphyseotomy is preferred to other possible procedures Symphyseotomy should not be attempted in primiparas with a generally contracted pelvis unless the conjugate diameter is at least 10 cm, and the cervix is completely dilated

ALICE M MEYERS

THE PRESENT STATUS OF TRANSURETHRAL PROSTATIC SURGERY

Collective Review

LEANDER WM RIBA MD FACS Chicago Illinois

IN this review of transurethral prostatic surgery an attempt is made to review the subject briefly and reflect the recent trends. So many articles have been written on this subject that a complete review is impossible in a short resume. An apology is extended to the authors of many worthy contributions not included.

The original description of middle lobe prostatic hypertrophy was read before the Royal Society by Home and published in *Philosophical Transactions of the Royal Society* on February 20 1806. This observation was confirmed by Howship in 1823. Howship's unique description of prostatism was recorded in *A Practical Treatise* published in 1823. On page 188 the symptoms of a seventy-four year old clergyman are described as follows:

Five years subject to a complaint attributed to flatulency in the lower part of the rectum where wind generated with great pain about the neck of the bladder and perineum. But when he could discharge wind downwards, the pain and agony subsided till the wind generated again which it was constantly doing and while the spasm lasted it induced great distress from urgent desire to pass water with aching and bearing down pains about the loins.

In 1830 Guthrie described a condition which he called bar at the neck of the bladder differentiating it from the enlarged prostate with which he felt it was frequently confused and advised division of this bar by means of an instrument (Fig 1) which he had devised. He reported a successful outcome in cases thus treated by him. Because it was a blind procedure the method soon lost favor.

Stafford in 1831 described a perforator adapted to the division of strictures as well as the splitting of an enlarged third or middle lobe of the prostate.

Civiale at the Paris Academy of Science in 1841 described three forms of bladder neck obstruction not of prostatic origin for which he was awarded prizes by the Academy of Sciences.

Instructor in Urology Northwestern University Medical School
and Assistant Member of Hospital Chicago 1905

in 1850 and by the Academy of Medicine in 1852. He developed an instrument which he called the *kiotome* for the purpose of relieving vesical neck obstruction. The results of its use were not satisfactory because it incised the obstructing tissue instead of excising it.

Mercier published a preliminary report on valves at the bladder neck in 1836 and a more complete discussion of the subject in 1841. In 1837 he devised an instrument somewhat like the present day punch for excision of bars at the bladder neck. On account of its limitations it soon fell into disuse. Mercier however recognized the fact that excision not division is the only means of relieving obstruction transurethrally.

E. Bottini introduced a great improvement into this work by producing an electrocautery instrument in 1854. This instrument resembled a lithotrite the male blade of which obtained a red heat from the passage of a galvanic current. With this heated blade the tissues were cauterized hemorrhage at operation being thus avoided. However his method was gradually dropped because it was a blind procedure followed by a high morbidity and mortality.

In 1897 Freudenberg combined Bottini's instrument with the irrigating cystoscope thus permitting cauterization to be done under direct vision. However this procedure caused unnecessary deep and widespread burns sloughing and constitutional effects not infrequently terminating in death. Wishard in 1902 recommended a similar procedure approaching the prostate by perineal incision.

The idea of relieving prostatic hypertrophy by electrocoagulation through a specially devised urethroscope was conceived by Goldschmidt in 1909 and used successfully by him and by Legueu, Damsky and Harpste.

The modern era of transurethral excision of prostatic tissue dates back to 1909 when Young first presented his famous cold punch for the removal of contractures and bars. His results were published in 1913. Following accurate diagnosis and skillful manipulation an adequate



Fig 1 Guthrie's median bar excisor used 108 years ago (Corbus Illinois M J)

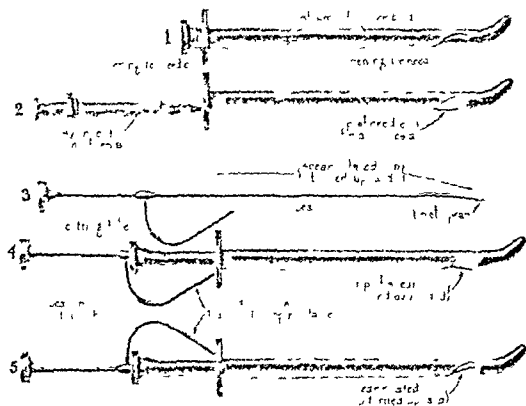


Fig 2 1 Improved Young's punch with a tube attached through which a long needle can be passed and an anesthetic injected into the tissue 2 A syringe attached to a long needle and the tip of the needle emerging near the fenestra 3 A spear with the tip at an angle to the shaft It is inserted into the inner cutting tube and plunged into the tissue As the spear is rotated, the tissues to be excised are drawn into the fenestra and held in position 4 Spear placed in punch, with tip turned downward 5 The spear has been rotated, showing the tip turned upward (Young J Am M Ass)

amount of tissue could be punched out with this circular knife. However, the lack of vision and inability routinely to cope with postoperative hemorrhage greatly limited its practicability. Young later modified the instrument so that hemorrhage could be controlled by cauterization of the punched-out areas with an electrocautery (Fig 2).

Beer, in 1910, brought out the idea of using a high-frequency unipolar current carried by an insulated wire through a catheterizing cystoscope to destroy vesical tumors, and suggested the possibility of its use for prostatic bars.

Stevens carried out this idea in 1913 by using the d'Arsonval current in place of the unipolar current.

At the same time, Luys brought out his "forage," which destroyed all obstructions, regardless of size, by massive fulguration. He claimed that, in his hands, this method had practically no mortality.

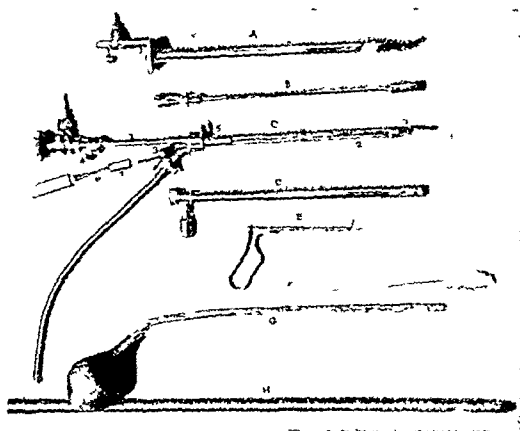


Fig 3 The cautery punch, with its accessories A, punch sheath, B, obturator, C, cystoscopic irrigating, fulgurating attachment, 1, set screw to prevent rotation of cystoscope, 2, slot for engaging the post on the punch sheath, 3, cystoscopic carrier, 4, irrigation channel, 5, electrode, 6, bakelite button, enabling easy rotation of the electrode, D, punch tube and blade, E, forceps, F, cotton pledget, G, suction tube, and H, large catheter with two eyes for drainage (Caulk J Am M Ass)

By modifying Young's instrument, Caulk, in 1920, presented a punch with the addition of a cautery to control hemorrhage (Fig 3). He was the first to prove that adenomas can be successfully removed transurethraly, and on July 12, 1929, at the Annual Session of the American Medical Association, he stated that during the past year he had removed 85 per cent of bladder-neck obstructions with his punch. Much credit belongs to Caulk for demonstrating that urinary obstruction due to benign enlargements can often be corrected without removal of the entire gland. In spite of strenuous opposition, Caulk persisted in his efforts, and in 1932 he presented 781 cases of vesical-neck obstruction operated upon transurethraly, in which 73 per cent of the moderately enlarged prostates were satisfactorily removed by a single operation with a mortality of 0.7 per cent (Fig 4). He advised against too prolonged operations, preferring, if necessary, a second intervention or multiple operations. He was cautious about extensive intravesical resections, and recognized adverse reactions inherent to the operation. Caulk's original instrument never became popular because vision was poor and the operation was carried out with the bladder empty. These shortcomings were later eliminated by his "visual cautery punch." While Caulk recognized the development of the use of the high-frequency current, he believed that this method would prove far inferior to the use of the actual cautery. After



Fig 4 Each bottle contains specimens removed from a patient at one sitting (Caulk J Am M Ass)

a series of experiments he concluded that high frequency currents produce heat in tissues away from the site of actual burning oftentimes beyond the thermal death point of the tissue that cautery heat does not penetrate to such depths its only heat resulting from conduction and being superficial By pathological study of the tissue excised with a McCarthy resector Corbus found the depth of the burn to be about $\frac{1}{3}$ mm which fact decreased the possibility of deep burns and postoperative contracture

From 1920 to 1932 many reports of modifications of Young's punch appeared

For the removal of prostatic bars Collings offered an electrotome in 1926 This instrument utilized the McCarthy panendoscope with an operating movable high frequency knife While it offered adequate vision obstructing tissue had to be destroyed rather than removed This fact limited its use to bars and contractures Day presented a cysto-urethroscope punch in 1930 and emphasized the necessity of removing sufficient tissue to relieve obstruction Kirwin in 1931 introduced an instrument containing a needle electrode for desiccating and a tubular rotating knife for removing obstructing tissue (Fig 5) Rose in 1925 devised a modification of the prostatic punch permitting cauterization under direct vision Cecil's instrument for relieving prostatic obstruction presented in 1932 consisted of an electrotome operating through a McCarthy cystoscope and was similar in principle to Collings instrument In the same year O'Connor advocated a combined method of treatment using the McCarthy punch supplemented by the Collings electrotome but restricted its use to vesical neck obstruction which is not associated

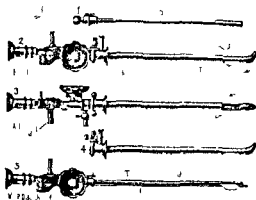


Fig 5 Kirwin rotary resectoscope 1 Bakelite outer sheath with catheter within the obturator 2 The assembled instrument 3 The outer sheath showing the fenestra Through this sheath irrigation is carried out the fluid passing around the tubes carrying lens lamp and electrode 4 The foroblique endoscope and tubes carrying the lamp and cutting and coagulating electrode (Kirwin J Urol)

with lateral lobe hypertrophy or a very large median lobe

For fifteen years prior to 1932 Mathe experimented with electro-coagulation forage (method of Luys) excision with the Collings electrotome resection with the Kirwin and Day resectors and resection with the Stern Davis and McCarthy loops In 1933 he reported 147 cases of which 143 were operated upon with 1 death He pointed out many of the technical difficulties but with certain reservations proclaimed the transurethral approach the operation of choice in at least 80 per cent of vesical neck obstructions

A modification of Leroy d'Etoilles instrument was presented by Foley in 1927 for the transurethral removal of prostatic tissue While Foley improved the instrument its shortcomings proved insurmountable

The limitation of vision of Young's punch was somewhat overcome by the median bar excisor presented by Braasch in 1918 By modifying the Braasch cystoscope Bumpus in 1926 was able to control bleeding by electrocoagulation of the bleeding points Up to January 1 1932 using a Braasch cystoscope with an enlarged fenestra and a multiple needle electrode (Fig 6) Bumpus performed 187 transurethral resections 75 of which were for adenomatous hyperplasia In reporting these operations he pointed out that

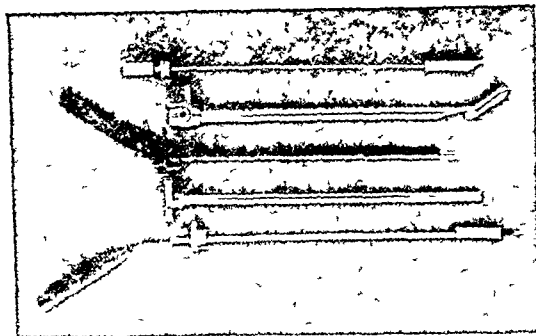


Fig 6 Braasch-Bumpus punch with Tyvand modification (Tyvand and Bumpus J Urol)

sufficient tissue, as much as 20 gm in some cases, had to be removed to eliminate the residual urine. Unless the residual urine was eliminated, the symptoms and prostatic congestion were not relieved. In 1933, after considerable experience with various resectors and punches, Bumpus stated, "The method or instrument is not considered of great importance, for there can be no question that the skill of the operator with whatever instrument he chooses is of far more importance than the instrument or method."

After further improvement of the Braasch-Bumpus punch, Thompson was able to demonstrate in 1933 that at the Mayo Clinic transurethral operations were being performed almost routinely for all types of vesical-neck obstruction. Figure 7 shows that, in 1927, in only 14.3 per cent of the cases the prostatic tissue was removed perurethrally, while, in 1933, 98 per cent of all obstructions were so removed. Thompson intimated that because the surgeons at the Mayo Clinic were familiar with the direct-vision Braasch cystoscope, removal of prostatic tissue with a similar refined instrument seemed to them logical and easy.

The more general acceptance of transurethral surgery coincided with the development of better "intravesical vision" and improved high-frequency surgical units. Stern deserves credit for the idea of transurethral excision of prostatic tissue with the aid of a high-frequency current. His instrument was called a "resectoscope." Because of the mechanical difficulties encountered, his instrument never came into general use. The resectoscope was placed on a practical operating basis by the ingenious T. Davis. With the improved Stern-Davis instrument, Davis demonstrated the possibility of removing obstructing prostatic tissue with safety. In 1931 he reported more than 200 cases in which such tissue was excised

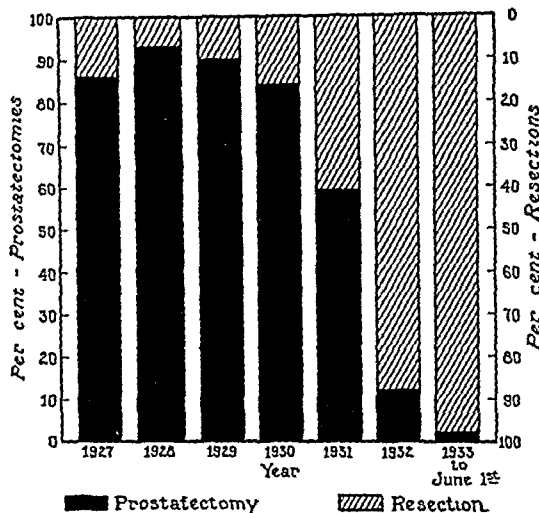


Fig 7 Percentage comparison of prostatectomy and transurethral prostatic resection (Thompson J Urol)

without serious complications or death, and later reported 748 cases treated similarly with a mortality of only 0.8 per cent. Forty-six (6.1 per cent) of the 748 patients had been previously prostatectomized. Only 24 (3.2 per cent) required a second resection. Davis had a series of 416 consecutive resections without a death. Wesson, in discussing Davis's paper, stated, "It is hard for me to reconcile the accuracy of the statements of those who report a long series with no mortality or morbidity, with others from men of equal standing who apparently follow all the rules and have much grief."

While the Stern-Davis resectoscope was used temporarily by many operators, it lost its popularity after the presentation and perfection of the McCarthy resectoscope with its foroblique lens (Fig 8). McCarthy published his first paper in 1932. His instrument allowed better vision, excision, and hemostasis (Fig 9), and therefore immediately became popular with the rank and file of urologists throughout the country. While McCarthy has remained very conservative regarding its indications, the deluge of papers which

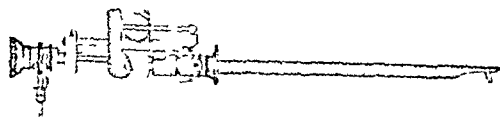


Fig 8 McCarthy resectoscope (McCarthy J Urol)

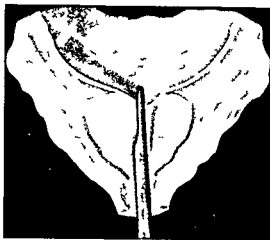


Fig. 9. Instrument in position for removal of right lateral lobe. The left lateral lobe has been removed (McCarthy J Urol)

have been published during the past six years has attested its usefulness.

Alcock early presented an honest report of his experiences with the McCarthy transurethral resector. He was immediately alert to its possibilities and shortcomings. In comparing the results of his first 400 resections with 400 previous prostatectomies in unselected cases he was able to prove that in his hands the transurethral approach was without doubt a far superior method. The number of hospital days was reduced from seventy-one to seventeen and a half. It became possible for 1 prostatic bed to take care of 4 patients instead of 1. There was an economic saving of \$50.00 per patient. For 500 patients the saving amounted to \$125,000.00. Alcock estimated a saving of \$7,200 per year on dressings alone. On the other hand he proved also the value of experience. In his first 50 cases the mortality was 15 per cent while in his last 275 cases it was less than 1 per cent. His total mortality in 400 cases was 6.5 per cent as compared with 24.2 per cent in 400 prostatectomies (including cystotomies).

Kretschmer observed that since March, 1932 he had performed only 1 prostatectomy. He reported on 282 resections performed upon 259 patients with a mortality of 3.9 per cent. He agreed with Alcock that postoperative sepsis is more apt than hemorrhage to cause death. He expressed the opinion that transurethral surgery would bring patients in earlier and that the relatively high mortality was due to the fact that a certain number were sent in for resection

because they could not stand an open surgical operation. He pointed out that 90 of 207 patients had serious heart disease. The average hospital stay in one group was six and seven tenths days. Routine vasectomies prevented the postoperative epididymitis incidence of 15 per cent. There was only 1 case of severe primary hemorrhage. Seven patients were treated by aspiration of the blood clots and 2 by resectoscopic excision of the bleeding point.

Engel and Lower summarized the individualization of patients in the selection of treatment. They expressed the opinion that all small and moderately enlarged prostates are amenable to resection and that unusually large prostates such as a large middle lobe or marked intravesical lateral lobes are perhaps unsuitable. The mortality following 198 operations performed upon 194 patients including bad risks and patients with carcinoma was 1.5 per cent. In the discussion Folsom commented upon his experience following 205 resections. He stated that only 0.9 per cent of the patients had a fever of over 100° F on the operative day. He was impressed also with the ease with which postoperative hemorrhage could be controlled as compared with its control after prostatectomy.

Lowsley in 1933 was amazed by the large series of resections reported. Up to May, 1933 covering a period of twelve and a half years he and 24 members of his staff had performed 144 closed operations upon the vesical neck in free and private cases with a reported mortality of 10.1 per cent in 89 cases. During the same period 535 perineal prostatectomies were performed with a mortality of 4.8 per cent. In commenting upon these large series of resections Lowsley stated:

One may draw only one conclusion and that is there are hundreds being operated on who do not need the operation at all. He believed that resection was wrong in principle in diffusely infected adenomatous prostates because it tended to seal off the tubules and establish a serious focus of infection. He compared this operation to futile tonsillotomies. Hicks in reporting 40 resections agreed with Lowsley that a large portion of an infected adenoma left behind will act as a focus of infection and that therefore in cases of infected adenoma resection can never replace prostatectomy. Peacock realized the significance of punch and loop resections but agreed with Lowsley and Hicks that large infected adenomatous prostates are treated better by complete removal. Goldstein and Levy emphasized the value of resection in poor risks regardless of the size or inflammatory status of the prostate.

Smaller series of resection cases (fewer than 100) were compared with prostatectomy by Kasten, Kearns, and Irwin. These reports emphasized the high mortality (10 to 25 per cent), high incidence of postresection infections, and mediocre results due to lack of experience.

While most foreign surgeons have been conservative regarding perurethral prostatic surgery, it is noted that the method is employed in nearly every country. Walker, in 1933, presented his views and a diathermy spiral-knife punch. He believed that the transurethral approach could not be substituted for prostatectomy, but recommended it for the following conditions: (1) slight enlargement with marked obstruction, (2) special circumstances under which total removal is contraindicated by a poor general condition or serious complications (the transurethral operation is an excellent alternative to catheter life or permanent suprapubic drainage), and (3) scirrhus carcinoma. A series of 100 cases with a mortality of 5 per cent was reported. In a later publication Walker emphasized the danger of postoperative hemorrhage and sepsis, the latter by far the more serious. In his opinion the McCarthy operation left behind a mass of coagulated tissue which acted as a nidus for organisms and sepsis. When an indwelling catheter was tolerated poorly or marked infection was present, cystotomy and resection were combined. While many techniques and instruments have their place, Walker believed that the trend was away from electrical resection in favor of the punch operation. Everidge, Hammond, Loughnane, Morrison, Ross, Doyle and Fegetter have reported their experiences in small series of cases. Their difficulties and complications were adequately stressed. The reported mortality varied between 4 and 20 per cent. The value of experience with transurethral surgery was emphasized by Doyle and Fegetter. A mortality of 20 per cent in the first 50 cases was reduced to 6 per cent in the third series of 50 cases. Morrison and Loughnane urged early operation before renal impairment, sepsis, and general toxicity occur. In 1934, Ponnett stated that in Great Britain the enthusiasm for the closed operation was waning. However, Everidge, in December, 1936, stated, "Five years ago in England to admit practicing resection almost amounted to a confession. Today there are few surgeons who do not include it. In the United Kingdom, where the customary conservatism is retained, case selection dominates the picture. To this end, not only is a most careful clinical study of the individual case essential, but the ability of the surgeon to assess the architecture of the bladder neck cysto-urethroscopically,

is even more so. Hence this operation should not be attempted by any but the most expert cystoscopists."

In France, many surgeons have shown interest in transurethral surgery of the prostate. Philip, Gayet and Verriere, Denis, Blanc, Cibert, and others have presented their views and experiences, but the majority have cited fewer than 100 cases. The European conservatism is emphasized by the tendency to limit the transurethral approach to contractures, small prostates, and inoperable malignancies. Denis cited as one objection to resections the fact that "as the American says, it takes about 50 operations to become proficient." After a visit to many clinics in America, Cibert concluded that transurethral resection should be given a place in everyday urological operations, but does not merit the exaggerated enthusiasm of some operators. He said, "In France, indwelling catheters are thought to be a source of aggravation and there they believe that suprapubic drainage is neglected in America. In good surgical hands there did not seem to be any appreciable difference in the results obtained by the Braasch-Bumpus or Stern-Davis-McCarthy resector. Poor results are obtained by resections as well as the classic operation, but it does not merit the ignoring it has received in France."

In a symposium on transurethral surgery at the French Congress of Urology in December, 1936, Fey stated that in men not suitable for prostatectomy, endo-urethral methods enable the bladder to close without great danger following cystotomy of necessity. Among men who are suitable for prostatectomy, the transurethral method is indicated only for those with a small sclerotic prostate. It may be of great help in dysuria with diverticula and trabeculation, and may prevent calculus formation. Perrier referred to the opposition to its use for inoperable carcinoma. In his opinion, resection is indicated in some cases of this condition. Heitz-Boyer reserved resection for very early and late cases, believing that in the intermediary stages of frequency or "period of combat," prostatectomy should be performed. Michon, on the other hand, is enthusiastic about resection and rejects for it only the large lateral lobes. In pure dysuria or frequency due to early adenoma, resection gave remarkable results.

At the twentieth meeting (Copenhagen) of the Northern Surgical Society a discussion on transurethral electrocoagulation by Abrahamson, Lendorf, Bohmansson, Wideroe, and Nystrom took place. Apparently because of lack of experience with American high-frequency surgical units, electrocoagulation was burdened with the same

complications as open surgery. Bohmanson favors suprapubic drainage and enucleation. His mortality in 60 prostatectomies was 3 per cent. Wideroe reviewed 333 cases of which 43 per cent were treated by electrocoagulation. His opinion was that electrocoagulation is a step in the right direction but cannot replace the radical operation. Abrahamson however reported that since July 1934 he had discarded prostatectomy in favor of resection on McCarthy's plan. As advantages of the latter he pointed out the freedom from operative shock, the absence of severe pain and sepsis, the short hospitalization and a mortality of 6 per cent. On the other hand he admitted that only after performing many electroresections did he begin to feel at ease with this operation.

From Australia and New Zealand small series of prostatic resections have been reported by Laidley and Earlam, Ardagh, Reay, Jose and others. Even with their limited experience these workers early recognized the indications, limitations and dangers of the operation. Their careful application of the new surgical approach is reflected in the absence of serious complications and a low mortality. Laidley and Earlam in 100 resections had a mortality of 1.7 per cent. Jose in 32 resections 0 per cent. Reay in 100 resections 1 per cent and Ardagh in 47 resections 13 per cent. In an excellent review Laidley and Earlam emphasized the value of experience with prostatic resections and noted with it a corresponding decline in the number of prostatectomies.

In Germany von Lichtenberg still favors prostatectomy. Only about 10 per cent of the obstructions are operated upon perurethrally in his clinic. The von Lichtenberg resectoscope is preferred. Wildegans published his experiences in 40 transurethral operations performed by 3 methods: electrocoagulation, 15; coagulation and resection combined, 5; electroresection, 20, with 3 deaths (7.5 per cent). Because of the frequent sepsis following electrocoagulation he prefers electroresection.

Akutsu of Japan published a series of 88 transurethral resections performed by the McCarthy method in 56 cases. The listed complications were: primary hemorrhage, 1; secondary hemorrhage, 4; cystotomy necessary, 5; temporary incontinence, 1; epididymitis, 2; and cystitis, 7. The results were excellent in 28 cases, good in 10, satisfactory in 6, and poor in 11 (19 per cent). The mortality was 7.3 per cent.

Kindt and Cibert cited the lack of enthusiasm for transurethral prostatic surgery in Europe as compared with America. They noted the necessity of organization, meticulous technique and

excellent assistant and nursing care for the consummation of this type of surgery. Where these requirements are met, transurethral surgery is an important step forward. Cibert intimated that the lack and ignorance of an adequate surgical unit and electric current are responsible for many failures.

CARCINOMA OF THE PROSTATE

One of the chief criticisms levelled against transurethral prostatic resection is that this operation may increase the incidence of prostatic carcinoma.

In Caulk's clinic 20 per cent of vesical neck obstructions have been found to be malignant. This percentage has been substantiated by post-mortem findings: Rich, 14 per cent; Walther, 30 per cent; Dossot, 18 per cent; and Moore, 16.7 per cent. Young said: "These startling statistics have placed on the medical profession a great responsibility in the duty to use every effort to recognize carcinoma of the prostate sufficiently early for radical cure." Geraghty stated that carcinoma of the prostate begins in the posterior lobe in 75 per cent of the cases. Moore agreed with Geraghty. Barringer, Dossot, Wilthard and others are of the opinion that carcinoma may begin anywhere within the prostatic capsule. Dossot stated that 11.6 per cent of prostatic adenomas undergo malignant degeneration. He added that two types of prostatic carcinoma should be noted: carcinoma arising from the adenomatous glands of the posterior urethra and carcinoma arising in the prostate itself. The latter may coexist with adenoma. Young states: "Fifty per cent of carcinoma is shown to be accompanied by benign adenoma of the lateral lobes, the two diseases being separate and distinct for a considerable period." Bibus has said: "Whenever carcinoma is associated with adenoma it arose from different portions of the gland and arises in the periphery of the true prostatic tissue surrounding the adenoma; therefore the malignancy is left behind in prostatectomy." Hunt reported that in a case of death four days after prostatectomy carcinoma was discovered in the prostatic capsule, whereas the operative specimen was pure adenoma. Bugbee, Young, Hirsch and Schmidt found small areas of carcinoma in surgically removed adenomas which were clinically thought to be benign. Of 41 adenomas examined post-mortem by Rich, 66 per cent were too small to be recognized clinically and were found in the outer margin of the gland. Even when the lesions were a few millimeters in size they showed a tendency to invade the capsule.

Young has favored perineal prostatectomy for carcinoma since 1906. Theoretically, this is the treatment of choice, but in general it has not been extremely satisfactory, the chief reasons being that only a few patients are seen sufficiently early and in others the early clinical diagnosis is usually not suspected. In a series of 500 patients admitted with carcinoma of the prostate, Young was able to perform the radical perineal prostatectomy on only 42. Of these 42 patients, 11 lived five years without recurrence. The operative mortality was 9.5 per cent, and some complication, such as incontinence, fistulae, or strictures, was mentioned. Young, however, stresses that isolated incipient nodules should be recognized early and exposed perineally for microscopic frozen sections. If carcinoma is found, a radical excision including the capsule, seminal vesicles, and bladder neck is indicated. Early this year he remarked, "Reports on hundreds of patients subjected to transurethral resection without a single effort to obtain a radical cure of prostatic carcinoma seems indefensible." Smith reports 11 of 50 patients as alive three or more years after perineal surgery, and an immediate mortality of 10 per cent. Dillon reported his perineal approach with radon seed implantation, but believed that better results were obtained with the resectoscope. Rolnick stated that transurethral resections disseminate carcinoma of the prostate, and reported his poor results following perineal prostatectomy. Twelve cases were operated upon with 6 deaths (50 per cent mortality) after eight weeks. Two (18 per cent) of 11 patients were incontinent.

Caulk and Bugbee, after many years of experience in treating prostatic carcinoma, believe that only palliative measures can add to the patient's comfort. Caulk now believes that he has never cured a patient of cancer of the prostate although he has followed up one for fifteen years. Bugbee recently expressed the opinion that the less done for prostatic carcinoma the better unless obstruction is present. After treating carcinomas previously by suprapubic and perineal removal and radium and deep irradiation therapy, he now elects to perform transurethral removal of obstructive tissue when indicated. As he has performed 63 resections upon 52 patients without a death and as 40 of the patients are still alive and comfortable, Bugbee believes resection to be the treatment of choice. Twelve patients died from twelve to forty-four months after surgery. Deep x-rays are used only in cases of bleeding.

In summarizing a series of 320 patients with carcinoma, Caulk found that only 203 had been treated. One hundred and twenty-nine were oper-

ated upon with the Caulk punch. Caulk also advised transurethral implantation of radon seeds and deep x-ray therapy as palliative measures. Thirty per cent of his patients were living at the end of three or more years. Eighteen per cent lived for four years, 12 per cent for five years, and 5 per cent for seven or more years. Caulk believes that these results compare very favorably with those of the more radical measures. Thompson and Emmett have recently reviewed a series of 107 patients treated by transurethral resection with a four-year so-called cure of 17 (15.8 per cent). Ten (9.3 per cent) have survived for five or six years. Two have been clinically cured.

That enucleation does not eliminate the possibility of malignancy later was reported by Emmett. Of a series of 67 patients who had previously undergone prostatectomy, 18 (27 per cent) were found to have carcinoma when resection was done. In 13 of the latter the carcinoma was probably present at the time of the original operation. In the remaining 5 the time between the original operation and the transurethral resection ranged from ten to nineteen years. Hunt has reported a case of carcinoma of the prostate occurring eighteen years after suprapubic removal of a benign adenoma.

The possibility of mistaking carcinoma of the prostate for adenoma has been argued by Young as an indication for perineal prostatic removal (not radical). Creevy has recently pointed out that since not more than 20 per cent of enlarged prostates are the seat of malignancy, the opportunity for cure which is lost if transurethral resection replaces perineal prostatectomy will not exceed 0.6 per cent, a loss more than compensated for by the lower mortality of the transurethral method.

Walshard reported finding 30 carcinomas of the prostate in 100 consecutive autopsies on men over forty years old who died of other diseases. The carcinoma was localized within the capsule in only 5 (16.6 per cent). Walshard added that in these 30 cases there were no clinical symptoms suggesting carcinoma.

Tietze, in examining 31 prostates, 15 surgical and 16 autopsy specimens, found atypical growths in 7 (22.6 per cent), and concluded that small carcinomas considered benign clinically may be present. Albarran and Halle interpreted these areas of epithelial hyperplasia as being borderline or actually malignant. Simonds, however, believes that isolated areas of hyperplasia within enlarged prostates cannot always be distinguished from carcinoma. It is evident, therefore, that the interpretation of microscopic sections may sometimes

be extremely confusing even to competent pathologists as has been pointed out by Cole

Ferguson recommends aspiration biopsy for early carcinoma of the prostate. A positive diagnosis was made in 59 of 100 cases. He adds that for greatest accuracy the pathologist must be familiar with the technique. Keyes and Ferguson favor the transurethral application of radon needles and deep x ray therapy.

Barringer reported 351 cases of carcinoma of the prostate. In only 16 (4.6 per cent) was the cancer localized to the prostate or periprostatic region. By means of deep x ray therapy and radon seeds he was able to control the disease for five or more years in only 20 (5.7 per cent).

Regarding treatment of carcinoma of the prostate. Reinle and Griffin recently commented that the results obtained are not considered with much enthusiasm. Prostatectomy either suprapubically or perineally roentgen therapy, and surgical procedures involving implantation of radium have proved unsatisfactory except in a few isolated instances. Those who regard carcinoma of the prostate as a fatal disease feel that they do the patient as much good and less harm by transurethral resection than by any other surgical method. Barringer, Nesbit, Bugbee, Caulk, Alcock, and many others have expressed favorable views regarding the treatment of carcinoma of the prostate by transurethral surgery if obstruction is present. This method eliminates the suprapubic tube and allows the patient to urinate normally. That dissemination of the carcinoma is rare following transurethral surgery is emphasized by Bugbee.

In most instances when malignancy of the prostate can be diagnosed clinically and by rectal examination the chances for cure are extremely remote.

INDICATIONS FOR TRANSURETHRAL PROSTATIC RESECTION

Considerable difference of opinion exists regarding the type of prostate that should be subjected to transurethral surgery. Young, Lowsley, Collings, and Kirwin believe that transurethral resection should be limited to obstructive lesions caused by small amounts of tissue such as prostatic bars, contractures, and small adenomas. McCarthy, Livermore, Mathe, Alcock, Herman, Day, Engel, and Lower, and many others believe that the majority of obstructions at the neck of the bladder can be removed transurethrally in well selected cases. Numerous foreign surgeons agree and reserve many cases, particularly the large prostates in good operative risks, for enucle-

ation. On the other hand surgeons with wide experience in transurethral surgery state that 98 per cent of obstructions at the neck of the bladder can be safely and adequately removed by this method. T. Davis, after having performed 1,052 resections, states that in only 2 per cent of cases is prostatectomy mandatory. With adequate transurethral armamentarium and experience, Alcock, Thompson, Kretschmer, Caulk, and Bumpus believe that all obstructions are suitable for transurethral removal provided the instrument can be introduced. For the larger prostates this group recommend limiting the operating time to from forty five minutes to an hour. Secondary resections are preferred to a long primary operation.

That many more patients who are poor risks are now being relieved of their vesical symptoms has been proven by Thompson and Alcock. During 1935, 109 (15.7 per cent) of the 695 patients in Thompson's series who were treated by resection were seventy five years or older. Of Hunt's series of 1,000 patients subjected to suprapubic prostatectomy, only 3.1 per cent were as old. The view that prostatic resection is a boon for the poor operative risk and the aged has been shared also by Livermore, Kretschmer, Wildbolz, Lower, and Goldstein, and Lev. Kretschmer stated that of his resection series 65 per cent had serious cardiovascular disease as compared with only 35 per cent of his prostatectomy group. Alcock, in discussing Young's paper read on June 9, 1937, at the Annual Session of the American Medical Association stated: "In one series of 1,500 cases of prostatectomy that I saw in the literature only 16 per cent of patients were over the age of 70. One third or 570 were under the age of 60. That group of cases represents the good risks and the mortality by any method should be low. Compared to that is a series of 1,500 cases I reported in which 64 per cent of the patients were over 70 and only 5 per cent under the age of 60. In the first mentioned series there were only 8 patients over 80 while in my group there were 143 over 80."

It has been said (Lowsley, Wesson, Pugh) that many patients are being subjected to transurethral surgery who should not be operated upon at all. Emmett studied 11 borderline cases with little or no residual urine which were treated by resection after eight weeks of conservative measures. Responses to questionnaires revealed that 8 (66 per cent) of the patients were more than satisfied with the operative result. Only 2 were unrelieved. Emmett suggests that conservative measures such as prostatic massages, dilatations, and instillations be used first. If no response is obtained he performs resection.

Culver, in 1935, said, "All workers in this field are of the opinion that prostatic bars and carcinomas should be handled by the transurethral method, some being of the opinion that these two obstructions only should be handled by this method. The question of removal of prostatic hypertrophies is one which, up to the present time, has not been thoroughly settled. There are enthusiasts of this method who operate upon all hypertrophies, regardless of the size or type, if it is physically possible to pass the necessary urethral instruments, and a more conservative group that confines their transurethral operations to relatively small hypertrophies, especially of the middle-lobe type. Obviously there are many urologists whose work in this connection would place them all along the line between these two extremes. It would seem, after careful study of the present status of this method, that it is here to stay, but whether it will gain or lose in popularity will depend altogether upon the permanence of relief obtained." Culver emphasized also that it is a difficult, very technical procedure which calls for instrumentation experience and knowledge of the anatomy of the posterior urethra and vesical neck. Sargent feels that resection is simpler and safer than prostatectomy, and expressed great faith in its future.

In a recent article Olson stated that the indications for prostatic surgery are being broadened to include patients with debilitated general health who were formerly denied surgery, as well as younger patients whose obstructions are incomplete. He added that as the technique of prostatic surgery has changed, so have the indications. One no longer serves the best interests of the patient by permitting him to harbor a partial obstruction. The obstruction cannot be long continued without injurious consequences to the urinary tract.

The majority of urological surgeons favor transurethral surgery in the management of carcinoma of the prostate with obstruction. For early carcinoma of the prostate, Young urges perineal exposure and radical excision when indicated.

The importance of adequate pre-operative study has been aptly emphasized by many contributors, among them Shivers, Papas, and McCarthy. The most careful operators and clinics carry out a complete preliminary general and urological investigation including, upon indication, x-ray films, cystograms, urethrograms, pyelograms, renal-function tests, blood-chemistry determinations, electrocardiographs, and complete blood and urine analyses. Ballenger, Elder, and McDonald say, "The diagnosis of urological disorders in elderly

men should be planned and executed so as to obtain the maximum information with the minimum of disturbance." Bumpus and Thompson report that after careful examination they have lately operated upon 70 and 65 per cent of the cases, respectively, without prolonged drainage, and have obtained results as successful as those following operation preceded by prolonged drainage.

COMPLICATIONS

Frequent publications have emphasized many serious complications occurring during or following prostatic resection. It is noteworthy that, with a few exceptions, the number and seriousness of the complications varied in proportion to the operator's experience. This was shown by the reports of Alcock and Laidley and Earlam. The most frequent and serious complications are post-operative sepsis and hemorrhage. Orr, in 1936, by questionnaire to the members of the American Urological Association, found that 73 surgeons who had performed 13,104 resections mentioned the following most frequent complications: primary hemorrhage necessitating opening of the bladder, 107 (0.8 per cent), secondary hemorrhage requiring fulguration, 164 (1.2 per cent), transfusion, 116, fulguration and transfusion, 54. Six hundred and forty-eight (5 per cent) of the patients had a severe postoperative infection. In a summary of 27,000 cases of transurethral resections, Chetwood noted that 98 per cent of the surgeons reported complications. The most frequent were hemorrhage, infection, pyuria, vesical cellulitis, gangrene, and septicemia. Others mentioned were urinary extravasation, pyelitis, pyelonephritis, uremia, thrombosis, urethral stricture, incontinence, and epididymitis. Only 2 per cent of the surgeons reported no complications. Of 100 cases of resection reviewed by Turner, pyelonephritis occurred in 20, late pyuria in 49, distortion of the trigone in 40, embolus to the liver and lungs in 1 each, and septicemia in 1. Pugh listed the following complications in 125 cases: infection 15, incontinence, 9, anuria, 4, epididymitis, 17 (in spite of vasoligation), failures necessitating prostatectomy, 29. Very few ruptured bladders and urethrectal fistulas have been recorded. Rudnick and Walker have pointed out separation of the trigone during resection. Davis states that this complication has not been observed by him. Intravesical explosions due to gases have been reported by Kretschmer and Hambleton. Bumpus, Alcock, and Thompson pointed out that shock is negligible after resection as compared with prostatectomy.

A complication occurring frequently following prostatic resection is epididymitis. That epididymitis may be serious and occasionally cause death was mentioned by Brown. The efficacy of early prophylactic vasectomy was studied by Abeshouse in 208 cases. No case of epididymitis developed. The complications following vasectomies were: vasitis 15, abscess in the scrotal wound 5, edema 3, and hematoma 2. Alcock, Kretschmer, Livermore, and Plaggemeyer have recommended routine vasectomies. Others perform vasectomies only upon the poorer risks and the aged (Thompson and Emmett 24 per cent).

Livermore mentions 3 cases of pulmonary embolism occurring in his series. Hunt lists 8 (0.8 per cent) following 1,000 prostatectomies. Infection is said to play a part in this complication. Young thinks colon tubes and enemas may dislodge clots. No effective treatment to combat embolism after its occurrence is known.

Late complications such as fibrous strictures of the anterior urethra have been emphasized by Plaggemeyer, Thompson, Bumpus, and Emmett. After preliminary urethral dilatation Plaggemeyer uses a No. 28 F. resectoscope first and later changes to a No. 24 to avoid prolonged trauma and roasting of the urethra. Bumpus feels that postoperative strictures are the result of unnecessary trauma to the urethra caused by the passage of too large an instrument or too prolonged operation by an inexperienced surgeon. Their occurrence cannot be justly attributed to the operative procedure. Emmett estimated the incidence of urethral strictures following resections at the Mayo Clinic at from 1 to 1.5 per cent. Most of the strictures are slight and respond to dilatation. Strictures extremely difficult of dilatation responded exceedingly well to an internal high frequency electro-urethrotomy. For cases of small or unusually long urethras, Thompson suggests a perineal urethrotomy in order that undue trauma to the anterior urethra be avoided. Such a case of carcinoma of the prostate with an excellent result was reported by him. The first case of prostatism treated by Wishard with the galvanocautery was approached through a perineal urethrotomy and a small rectal speculum.

During the early days of resection much comment was heard regarding the probabilities of postoperative strictures in the resected area, but only a few cases have been observed. One case was recalled by McKenna in discussing Kretschmer's paper.

While incontinence has been mentioned, it perhaps occurs more frequently than reported. Orr noted an incidence of 0.8 per cent following 13,104

resections. This complication should be charged to the operator.

Some effort has been made to control operative bleeding and calculate resection blood loss. Riches suggests injecting a mixture of 0.5 c cm of 1:1000 adrenalin and 9 c cm of 1:1000 procaine into the tissues to be resected to reduce general oozing. Livermore has suggested injecting pituitrin and Livermore boiling hot water to control operative bleeding. Hubby noted an apparent hemostatic effect from congo red, but it did not reduce the blood loss sufficiently to warrant its routine use. Pilcher and Sheard in 55 cases noted a blood loss of 200 c cm or less in 27 per cent of from 200 to 400 c cm in 4 per cent of from 400 to 600 c cm in 16 per cent and of more than 600 c cm in 33 per cent. The average blood loss was 479 c cm with a fifty-four minute average operating time. In another study of 55 cases operated upon with the new Thompson resector the average blood loss was reduced to 291 c cm and the operating time to thirty-nine minutes. These figures are quite at variance with the findings of Baillie, who noted an average blood loss during resections of 2.1 oz. as compared with 8 oz. in prostatectomies.

A much better understanding of the blood supply of the normal and hypertrophied prostate was brought about by the studies of Flocks. Flocks found 2 groups of arteries in the prostate: an external capsular group which shows little change with age or hyperplasia, and an internal group, the urethral group, which enlarges significantly with age and very markedly with hyperplasia. An appreciation of Flocks' studies during resection has minimized resection bleeding. Postresection bleeding may be minimized by the Foley balloon catheter (Fig. 10). On tract on the distended balloon exerts pressure on the vesical neck and prostatic bed.

Regarding the management of infection, very little detailed information is noted in the literature. Adequate amounts of intravenous or subcutaneous isotonic glucose or saline solutions, constant postoperative catheter drainage, and general supportive measures seem to be routinely recommended. In addition, Livermore suggests methanamine orally and intravenously. Gaudin, Zide, and Thompson have not found the routine oral administration of sulfanilamide particularly helpful. Emmett is of the opinion that sulfanilamide may help to clear up late pyurias. Engel has recently pointed out the dangers of preoperative infections, particularly those caused by an indwelling catheter. He recommended a trocar cystostomy puncture for these cases and added

that patients who die as the result of our pre-operative management should be included in the mortality statistics

MORBIDITY AND MORTALITY

That either suprapubic or perineal removal of the prostate may entail hospitalization for months, carry from 5 to 50 per cent mortality, and exclude many patients from surgical relief is well known. However, after prostatectomies performed by a few experts the hospital stay has been a matter of from only four to five weeks and the mortality has been much lower. Young has an enviable record of 2,800 perineal prostatectomies with a mortality of 2.8 per cent. Lowsley's mortality in 535 perineal prostatectomies was 5.8 per cent. Bugbee, in 1932, reported 233 prostatectomies with death in 2 (0.86 per cent). Peacock reported 117 suprapubic enucleations with death in 8 (6.8 per cent). In 1,000 suprapubic prostatectomies reported by Hunt the mortality was 5.4 per cent. Swan and Mintz, reviewing prostatectomies for benign hypertrophy at the Massachusetts General Hospital between 1926 and 1930, inclusive, reported 170 cases with death in 10 (5.9 per cent) and an average hospital stay of forty-eight days. Seventy-three (43 per cent) of the patients had postoperative complications. Eight (5 per cent) had postoperative hemorrhage. The previous mortality of 18.9 per cent was reduced to 5.8 per cent by careful co-operative study and selection of patients for operation.

In a recent review of the 33 suprapubic and perineal prostatectomies performed on patients more than eighty years of age at the James Buchanan Brady Foundation of the New York Hospital since 1920, Twinem reported that the total operative mortality was 33½ per cent. Alcock performed resection on 124 patients more than eighty years old with a mortality of 11.3 per cent. During 1935 Thompson, at the Mayo Clinic, performed resection on 38 patients more than eighty years of age without a death.

Negley found a resection mortality of 11 per cent in the cases of charity patients and of 12 per cent in the cases of private patients. In the charity group the enucleation mortality was 6 per cent, whereas in the private group it was only 2 per cent. Negley noted that 73 per cent of the patients treated by resection were admitted one day and operated upon the next, and that 75 per cent of the resection deaths occurred in this group. He emphasized that the mortality might have been reduced by a little preparation.

Emmett reports 3,229 resections on 2,894 patients performed at the Mayo Clinic since 1931

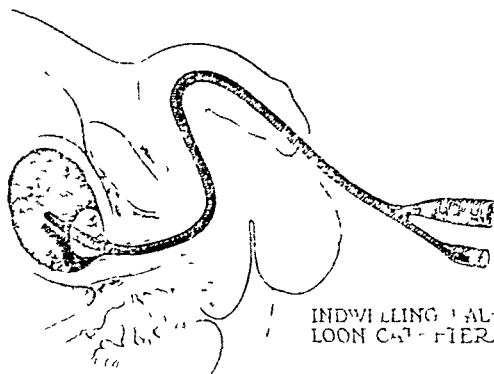


Fig 10 Foley indwelling balloon catheter inflated with water. Extremely useful in postresection and conditions in which permanent urethral drainage is desired.

with a 1 per cent mortality and an average hospital stay of eight days. T. Davis has performed 1,052 resections with a mortality of 0.8 per cent and a hospital stay of eleven days. Following 2,774 punch operations, Caulk reported a mortality of 0.9 per cent. In Orr's summary, 73 surgeons reported 13,104 resections with 370 deaths (2.8 per cent), and 5,062 prostatectomies with 195 deaths (3.9 per cent). Orr also emphasized the value of experience in relation to mortality. He noted that 5 urologists who had operated upon more than 500 cases each had a combined mortality of 1.9 per cent in 4,767 cases while 25 who had done between 100 and 200 resections had a combined mortality of 4.1 per cent in 3,530 cases. In his first 400 resections, Alcock's mortality was 6.5 per cent, while in the last 500 of 1,500 it was 1.4 per cent. Folsom reported 225 resections with 10 deaths (4.4 per cent). Goldstein and Levy mention a mortality of 11.8 per cent following resections in poor risks. Rolnick and Riskind in 1936, commenting on prostatic mortality, presented a series of 897 cases from the urological service of the Cook County Hospital, Chicago, for the past five years. The following operations were performed: cystotomy, cystotomy and suprapubic prostatectomy, cystotomy and resection, and transurethral resection. Cystotomy was performed 598 times with 171 deaths (28.6 per cent). A second-stage suprapubic prostatectomy was performed 235 times with 51 deaths (21.7 per cent). Perineal prostatectomy was performed 117 times with 20 deaths (17 per cent). During the years 1933, 1934, and 1935 there were 283 transurethral resections with 51 deaths (18 per cent), 63 after cystotomy. Rolnick and Riskind pointed out that for the five-year period the mortality of

2 stage suprapubic prostatectomies at the Cook County Hospital was practically 50 per cent. The records of that hospital show that during 1935 237 patients were operated on by all methods including cystotomy with 50 deaths (21 per cent). One hundred and ten of the operations were resections with 16 deaths (14.5 per cent). Thus it seems that resections have been an important factor in reducing the mortality in poor risks at the Cook County Hospital. Rolnick, after performing 200 resections, expressed the opinion that the technique is more difficult than that of either suprapubic or perineal enucleation and requires experience for successful results.

In reviewing the status of resection in 1935 Day presented interesting data from the Los Angeles County Hospital. Among the 154 cases treated by resection there were 19 deaths (11.2 per cent). Among 84 patients the prostates were removed with 6 deaths (7.1 per cent). The 11 operators with 2 exceptions reserved the worst risks for prostatectomy. The 2 who performed resection on every patient were men with wide experience; their mortalities were 16 and 20 per cent, respectively.

Mackay collected statistics from hospitals in the Pacific Northwest in 1937 and reported. Resection mortality varied widely from 2.5 to 25 per cent. The prostatectomy death rate varied likewise 4.3 to 6 per cent. The average hospital stay for the resection cases was seventeen days for prostatectomy thirty six days. He stated that experience in recent years was favorable to prostatic resection.

Alcock's statistics seem to reveal an increase in morbidity and mortality with the removal of larger amounts of tissue. In a series of 200 cases reported by Thompson and Buchtel in which 25 or more grams of tissue were removed the immediate mortality was 1.5 per cent.

ANESTHESIA

Regional or spinal anesthesia is preferred by most urological surgeons for operations upon the prostate. General anesthesia is often contraindicated by the patient's general condition or the anesthetic in question. Ether anesthesia is poorly tolerated by patients of advanced years and may be followed by serious pulmonary or renal complications. Ethylene gas is a desirable general anesthetic but cannot be used in the presence of the cautery or the high frequency current.

For prostatic resections Thompson, Campbell, Emmett, Papas, Sargent, Nesbit, Ewell and many others prefer low spinal anesthesia induced with dosages ranging from 50 to 120 mgm. The advan-

tages of spinal anesthesia are complete relaxation, relatively few general reactions, absence of pulmonary irritation and ease of administration of the anesthetic by the trained anesthetist. Campbell, after analyzing 1,520 spinal anesthetics for urological operations, reported that the mortality had been reduced 4.4 per cent. Four deaths traceable to the anesthetic occurred in his series. He added that headaches, respiratory embarrassment, nausea and vomiting were occasional sequelae. A preliminary injection of ephedrine sulphate was given routinely to support the blood pressure.

Foss and Schwalm reported their experiences with 1,000 spinal anesthetics and 1,000 ether anesthetics. The mortality was 1 death in the spinal series and 10 deaths in the ether series. Saklad remarked that spinal anesthesia is indicated particularly in the presence of pulmonary disease and that for prostatic patients with this complication the anesthesia of choice in transurethral surgery.

Pemberton has said: "I have never seen a serious complication as the result of the administration of spinal anesthesia as used at the Mayo Clinic."

Bower, Clark and Burns emphasized that in proportion to the number induced spinal anesthetics are responsible for more deaths than any other anesthetics but that the mortality diminishes with experience. Keyes and McLellan reported 2 deaths from spinal anesthesia induced with nupercaine. Deaths from spinal anesthesia have been reported also by Falk, Arnheim and Koster. Lindemulder reported 2 fatalities from spinal anesthesia and advanced the theory that all spinal anesthetics produce a temporary acute myelitis. Experimentally Davis, Haven, Givens and Emmett found constant inflammatory changes in the leptomeninges. They stated that spinal anesthetic solutions are hemolytic as well as myelolytic and seem to act on the myelin of nerve fibers as they do on lipoids of the red cell membrane; they cause dissolution. Postspinal anesthesia complications have been reported by Nonne and Demme, Donovan, Beretervide and Rechniewski, MacLachlan and Evans.

Brown and Debenham disagree with the popular conception that spinal anesthesia is followed by fewer pulmonary complications than inhalation anesthesia. In a series of 812 cases they found that pulmonary complications were 4.29 times more frequent after subarachnoid anesthesia than after inhalation anesthesia in spite of the fact that more bad risk patients were operated upon under inhalation anesthesia. The

adverse ratio was constant, regardless of the region of the body operated upon or the type of operation

Regional anesthetics which have certain advantages when used in operating on older patients with vascular disease are complete transsacral block or caudal anesthesia. Caudal transsacral block was first employed by Labat, and is one of our most dependable forms of regional anesthesia in certain selected cases. Caudal and transsacral block anesthetics have been recommended by Young, T. Davis, McCarthy, Wildegans, Sword, and many others for operations on the prostate by the transurethral method. Rovenstine and Martin have compared their experiences with spinal and transsacral anesthesia. Rovenstine found that, when skillfully administered, from 40 to 50 c cm of 1 per cent procaine solution injected into the sacral canal and foramina produced satisfactory anesthesia. There were no contraindications to its use. Martin discussed a series of 272 prostatic resections performed under spinal anesthesia (185) and caudal transsacral anesthesia (87). He noted no mortality, but an increased morbidity in the spinal group. He mentions 9 ruptured bladders in the spinal series.

The chief objections to caudal and transsacral block have been a large percentage of failures, incomplete anesthesia, and occasional priapism during resection. Failures have been reported by Berry (16 per cent), Shaw (17 per cent), Scholl (7 per cent), and Lewis (15 per cent). E. Davis reported a series of 229 consecutive perineal prostatectomies without a failure or the addition of gas. In his opinion, transsacral block is free from risk. Transsacral block was employed by Davis and Owens in over 1,000 cases without a fatality or serious reaction. As in the occasional case the dural sac lies unusually low, routine aspiration is advisable after insertion of the needle into the sacral canal. In the opinion of Davis and Owens, the many failures which have been reported are the result of too limited experience with the method. The average time consumed in inducing transsacral block has been twelve and a half minutes. Davis remarks that transsacral block has been the major factor in lowering his mortality.

Wishard, Hamer, and Mertz devised an angular resectoscopic needle which permitted deeper infiltration anesthesia prior to resection. Thirty-two of 33 resections carried out under local infiltration novocaine anesthesia were found to be entirely successful. Young recommends local infiltration for resections with his improved transurethral excisor.

RESULTS

A great deal of skepticism was justly raised in 1932 and 1933 by Randall, Day, Young, Lowsley, Kirwin, Wesson, and others about the practicability of resecting a partial adenoma of the prostate. Rapid recurrences of symptoms were predicted. Bugbee aptly said, "Only time will reveal how enduring this relief will prove to be." Nevertheless, Caulk, Thompson, and Bumpus noted that in some instances after resection, when the residual urine was corrected, there was a definite shrinkage of the remaining prostate. This had long been known to occur following cystotomy for benign prostatic obstruction. Joly doubted Caulk's theory regarding shrinkage after partial removal. After an interval of from one to three years, he had performed a prostatectomy on 8 patients who had previously had a resection. The microscopic sections showed no variation from the typical microscopic appearance of hypertrophy. Pugh is also opposed to the shrinkage theory. He said, "If resectionists make good on their claims, we must of necessity revise our notions of the pathological changes in this gland. Cienchanowski claimed that prostatitis was the forerunner of so-called hypertrophy and was denounced for it. All said it was tumor. Some day I believe there will be a reversal of this trend."

Thompson discussed the cases of 1,694 patients operated upon at the Mayo Clinic from January 1, 1913, to January 1, 1935. Of this series, 49 (3 per cent) had to be re-operated upon for obstruction at the bladder neck. In the cases of 16 of these 49 patients the original diagnosis was carcinoma of the prostate, in 10, median bar or contractures of the vesical orifice, and in 23, adenomatous prostate formerly treated by prostatectomy. Symptoms of obstruction recurred in a greater proportion of the cases of inflammatory or bar obstruction, for which the punch operation is conceded to be the procedure of choice, than in the adenoma group. Of the 23 patients, 6 stated that they had never been entirely relieved following their first operation. Of the 2,347 patients treated by resection at the Mayo Clinic, re-operation was necessary in 3.8 per cent. Thompson said that the incidence of recurrent obstruction following resection has been lower than predicted. Of Davis' series of 748 cases, only 24 (3.2 per cent) required re-operation. On the other hand, 40 (6.1 per cent) of his patients had previously undergone a prostatectomy. Kretschmer gives the incidence of re-operation as 10 per cent. Among the 13,104 resections, summarized by Orr, secondary resection was necessary in 477

(3.7 per cent) and subsequent prostatectomy in 172 (1.3 per cent)

While Caulk and T. Davis predicted transurethral prostatectomy as the ultimate goal Emmett recently has shown that with improved instruments (Fig. 11) technique and organization the amount of tissue which may be removed perurethraly approaches the amount previously removed by enucleation. From the record of 3203 prostatic removals at the Mayo Clinic, suprapubic or perineal it was found that the average weight of tissue was 44.1 gm. Only 7.3 per cent of the specimens weighed more than 100 gm. For the first nine months in 1937, the average weight of tissue removed per urethra was 23.6 gm. The average amount of tissue removed transurethraly was lowered by the many cases of median bar and contracture of the vesical neck in which formerly the risk of prostatectomy would not have been accepted. That an increasing amount of tissue can be removed in a forty-five minute operating period with added experience was emphasized by Emmett. In 80 per cent of the resections performed during September 1931 there was no case in which 30 or more grams of tissue were removed in a forty-five minute operating period. During September 1937 85 per cent of the resections in the forty-five minute period revealed the following: in 33 per cent of the resections 30 or more grams of tissue were removed; in 21 per cent 40 or more; in 10 per cent 50 or more; and in 5 per cent 60 or more.

While many satisfactory functional results are obtained residual symptoms remain in a small percentage of cases. It was soon recognized that removal of an insufficient amount of tissue resulted in protracted pyuria or persistent vesical symptoms or both. Alcock early observed that all of the obstructive tissue must be removed to obtain a satisfactory result. He was the first to admit that not all of his resection results were perfect but added that some of his prostatectomy results were also imperfect. T. Davis, Thompson and Emmett have stressed the necessity of a thorough primary operation.

Bumpus emphasized that when preparatory preparation is reserved for those with impaired renal function and severe infection and transurethral resection is substituted for prostatectomy the result in 499 cases reviewed would seem to indicate this new procedure was a direct step forward in the treatment of prostatic obstruction giving lasting functional results equal if not superior to those obtained by more radical procedures. In 1932 Bumpus concluded that the late results of

transurethral resection indicate that recurrence of obstruction even in cases of adenomatous hypertrophy will be the exception.

Of Hunt's series of 1000 patients treated by prostatectomy only 54 per cent obtained complete relief from their vesical symptoms and only 29 per cent were markedly benefited. The total incidence of satisfactory results was therefore only 83.3 per cent.

E. Davis stated in 1935: Prostatic resections will partially replace but not supplant prostatectomy. It seems doubtful whether in the last analysis the transurethral method considering mortality rate immediate and functional results offers as great a degree of assurance of continued health and comfort as does perineal prostatectomy.

COMMENT

The most intriguing observation seems to be that with improved instruments and technique we are reverting to the original surgical attack on the prostate made over one hundred years ago. While it is still too early to predict the final results of prostatic resection it may be readily observed that perurethral prostatic surgery has made tremendous strides during the past six years. It is recognized that obstruction due to bars, contractures and small adenomas should be managed transurethraly. The difference of opinion is based on the moderately enlarged and large adenomatous group of prostates. In this group the deciding factors seem to be the capability and experience of the surgeon. The removable amount of tissue increases proportionately with the surgeon's experience. That so-called prostatic resection is inadequate in many instances has been substantiated. The goal of the resectionist is transurethral prostatectomy. That transurethral prostatectomy is possible with adequate experience and equipment has been shown repeatedly. When transurethral prostatectomy is more routinely performed many of the objections to prostatic resection will disappear.

The morbidity and mortality have been materially reduced by the experienced resectionists. The hospital stay has become a matter of days instead of weeks. In many instances there has been a marked economic saving to patients and public institutions. Immediate postoperative shock has been eliminated to a great extent. Many more patients who are poor surgical risks may now be given partial or complete relief from distressing vesical symptoms. As the bladder remains closed many diverticula have become less troublesome. The use of the permanent suprapubic tube is becoming the exception. Patients

are willing to submit to operation earlier, before marked structural and complicating changes occur. Operating upon patients earlier in the progressive course of their obstruction will further reduce the morbidity and mortality. When no alternative but enucleation carrying a mortality of from 5 to 50 per cent was available, the safest course was to wait until the extreme necessity arose.

Most patients with carcinoma of the prostate are seen when radical surgery is no longer curative. Careful post-mortem studies reveal early dissemination of the malignant cells by way of adjacent structures, lymphatics, and perineural sheaths. This dissemination may occur before the onset of clinical symptoms. There is an early tendency to invade the capsule. When the capsule is left behind, the chances for clinical cure are equally good with a transurethral, perineal, or suprapubic prostatectomy. The treatment of choice in early cases should be the radical prostatectomy of Young. In practice, however, few patients are seen sufficiently early to warrant this radical procedure. Moreover, in average hands, this operation has given discouraging results. Only the occasional patient is clinically cured of carcinoma of the prostate. Pathological studies show that in the majority of instances of urinary obstruction palliative deep x-ray therapy with transurethral resection is the most rational and satisfactory treatment at the present time.

The entire responsibility of the prostatic problem no longer rests entirely upon the shoulders of the urologist. General practitioners, internists, medical advisors, and others who see the patients early in the course of their obstruction are no longer justified in advising prolonged conservative measures, procrastination, and ineffectual home or office remedies. It is not sufficiently appreciated that prostatic hypertrophy is a progressive affliction which is accelerated by infection. When an adenoma of the prostate is infected, amelioration of the symptoms may be brought about temporarily by conservative treatment. Even when it is uninfected, none of the known conservative measures, including use of the available hormones, will materially retard its progress. A promise to cure a benign prostatic enlargement without operative removal by one of our present-day conservative measures is based on pathological ignorance and misunderstanding of this serious problem.

Not all patients should be operated upon early. There may be adequate reasons for postponing surgery. As a group, however, they should be operated upon earlier, before serious structural

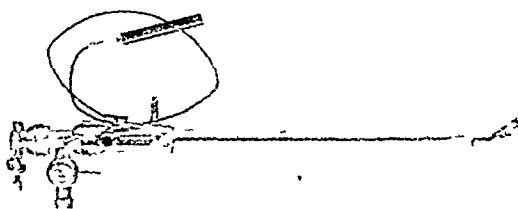


Fig 11 Thompson resectoscope (Emmett J Am M Ass)

changes occur. The operative interference should no longer be measured by the amount of residual urine. A patient with no residual urine may be a more urgent surgical problem than one with considerable retention.

Most urological surgeons of experience concede the advantages of transurethral prostatic surgery. Considerable credit should be given to those who were well trained in open surgery, but who for the benefit of their patients have pursued the transurethral method and mastered its technique.

Unless favorable circumstances and organization surround the operator, and he is experienced, the patient's outlook is best served by open surgery. There are still patients upon whom an enucleation should be performed. In expert hands, radical removal by suprapubic and perineal surgery has been followed by a low mortality and fairly good results.

One of the striking facts revealed by this review is that the chance of a favorable result from prostatic surgery may be enhanced 50 times in some localities as compared with others. It must, of course, be realized that charity services care for many exceedingly bad risks. While some of the high mortality on such services may well be charged off against the bad risks, in all fairness the staff of a urological surgical service must assume considerable responsibility by virtue of their appointments. Some of the highest mortality rates seem to be reported from institutions where political influence rather than merit perpetuates the staff. The reputation of a surgical institution is maintained, not by physical equipment, but by its competent surgeons. If unusually high mortality rates prevail, its clientele will become extremely fearful and perhaps wisely postpone surgical intervention until the extreme emergency arises.

Notwithstanding its failures and shortcomings, transurethral surgery has been one of the outstanding accomplishments in urology during the past ten years. While it is generally conceded that Young, Keyes, Hunt, Squier, and others were

pioneers in open prostatic surgery it is frequently not appreciated that Young also initiated the modern era of transurethral prostatic excision twenty nine years ago. The credit for investigating the vast possibilities of this method belongs to many workers including electric technicians and engineers. Some of its medical pioneers were Caulk, Braasch, Stern, T. Davis, McCarthy and Mathe. Others like Alcock, Thompson, Kretschmer and Bumpus by persistent effort improvement of technique and organization have presented to the profession the benefit of their large experiences and perhaps achieved the pinnacle of success in modern prostatic surgery.

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GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Kutzmann, A A Squamous-Cell Carcinoma of the Renal Pelvis *J Urol*, 1938, 39 487

Squamous-cell carcinoma of the renal pelvis is of infrequent occurrence, although a review of the literature indicates its increased recognition in recent years. Six and four-tenths per cent of kidney tumors occur in the renal pelvis, and of these, squamous-cell carcinomas make up about 17 per cent. Eighty-one authentic cases, including the author's, have been presented in the literature.

There is no pathognomonic clinical syndrome, and no pre-operative diagnosis has been recorded. The onset of the affliction is insidious, and the clinical course is rapid and fatal. Nephrectomy is the only known treatment, and no five-year cure is on record.

Squamous-cell carcinoma of the renal pelvis is usually associated with chronic renal infection, and with calculous disease in more than one-half of the cases. Pathologically, the growth presents a paradox, since it is an epithelial type of tumor, derived from tissues of a mesothelial and endodermal origin. This transition is explained by a protective metaplastic process, that is, leucoplakia on the mucosa of the renal pelvis. Malignant degeneration occurs with continued irritation.

A rather typical case report is presented in detail. In this instance, squamous-cell carcinoma of the renal pelvis was associated with leucoplakia, with an intense and chronic, destructive and infective pyonephrotic process, calculous disease, and metastases to the lymph glands of the renal pedicle. As in nearly all other cases, the postoperative course was rapidly fatal, the patient succumbing in a few months following nephrectomy.

In association with the report of his case, the author presents illustrations descriptive of the gross and microscopic pathology. An extensive bibliography is recorded. JOHN G CHEETHAM, M D

Ockerblad, N F, and Carlson, J E The Distribution of Ureteral Pain *J Urol*, 1938, 39 745

By means of especially constructed ureteral catheter electrodes, the authors have mapped the surface distribution of pain sensations arising along the course of the ureter. They found the most common area of ureteral pain to be in the lower quadrant, on or below a line drawn between the anterior superior spines of the ilium, and half way between the midline and the spines. On the right side this is always inside and below McBurney's point, and distinct from it. The authors have designated this location as the focal point of ureteral pain. Renal pain is always in the back, in an area the center of which is the costovertebral angle. The area forms a circle of from 8 to 10 cm in diameter.

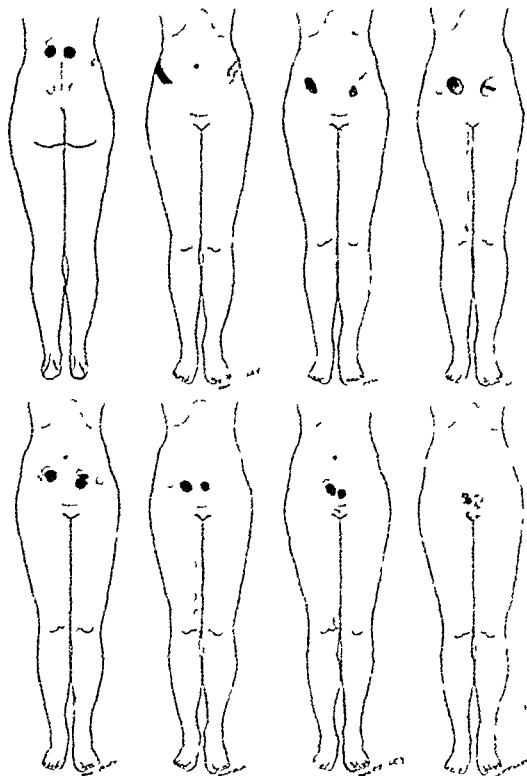


Fig 1 Composite of 20 cases showing pain distribution at various levels of right and left ureters including (a) 30 cm from ureterovesical orifice, (b) 27 cm, (c) 25 cm, (d) 20 cm, (e) 15 cm, (f) 10 cm, (g) 5 cm and (h) 1 cm levels. Each composite consists of 20 determinations. Degree of shading illustrates more common (dark areas) and the less common areas to which pain is referred at levels stated from ureteral orifice.

On the basis of their experiments, the authors are inclined to believe that pain arising from the ureter is splanchnic in origin. D E MURRAY, M D

Lattes, R, and Sansone, F Implantation of the Ureters into the Urethra after Total Cystectomy (Innesto degli ureteri nell' uretra dopo cistectomia totale) *Arch ital di chir*, 1938, 48 605

The uncertainty of successful transplantation of the ureters has limited the application of the operation of complete cystectomy for extrophy of the bladder, carcinoma, tuberculosis, and incurable vesical fistulae. The various methods employed for transplantation of the ureters may be divided into the following classifications: (1) insertion into the

skin of the abdomen (2) insertion into a segment of bowel (3) insertion into a new bladder made from an isolated loop of bowel and (4) insertion into the urethra

The authors report their experimental studies on the transplantation of the ureters into the urethra. In female dogs after simple cystectomy the ureters were implanted into the short remaining urethra. The animals were sacrificed after a period of time and the specimens studied. There was a definite tendency on the part of the remaining urethra to dilate in its proximal two thirds and to form a new urinary reservoir with development of urinary continence after about three months. The distal one third of the urethra showed a definite tendency to ward hypertrophy so as to form a new sphincter. Histologically the dilated urethra did not present the structure of the normal urinary bladder.

A LOUIS ROY M.D.

BLADDER URETHRA AND PENIS

Simons I. Neurological Studies by Means of the Microcystometer and the Sphincterometer Studies in Bladder Function VII (Preliminary Report) *J Urol* 1938 39 791

The author presents further studies of the bladder function by means of the microcystometer and the sphincterometer. A brief review of the neurological control of micturition is given. Cystometry and the interpretation of cystometrograms with 10 illustrative cases are discussed.

The author concludes that bladder dysfunction on a neurological basis must be divided into two types namely motor (cord bladder) and sensory (cord bladder) types. In the latter type there are clinical therapeutic and cystometrical data which lead toward a conception of a causative lesion located entirely in the autonomic nervous system while in the former or traumatic type there are breaks in the conduction paths in the autonomic nervous system.

D. E. MURRAY M.D.

Johnson C. M. Diverticula and Cyst of the Female Urethra *J Urol* 1938 39 506

Recent interest in lesions of the female urethra has encouraged the report of various cases of diverticula or urinary pockets. This article deals chiefly with the etiology, frequency and treatment of diverticulum of the female urethra.

The author states that there is no proof as yet as to the etiology. Some diverticula are probably acquired as a result of trauma and infection. Many are congenital cysts originally but become infected the infection causing symptoms and hence they are recognized later in life when the patient is between twenty five and thirty five years of age.

Diverticula or cysts of the female urethra are more common than one might suspect and have undoubtedly been frequently overlooked. Nine cases were observed in one year's time in a relatively small outpatient service.

The diagnosis is made by observation and digital examination of the urethra and is frequently missed because the condition is not being sought. Further diagnosis is made by x-ray examination after the cavity has been filled with an opaque medium.

Surgical treatment is simple and curative and is in most instances the preferable procedure.

The technique of the operation used by the author is effectively described by illustrations and short protocol of the operative cases are given which show the satisfactory results which the author has secured.

JOHN G. CHERTHAM M.D.

GENITAL ORGANS

Champy Heitz Boyer and Coujard. The Mechanism of the Action of Male Hormones on Prostatic Hypertrophy (Le mécanisme de l'action des hormones mâles sur l'hypertrophie prostatique) *Presse méd. Par* 1938 46 1097

Champy Heitz Boyer and Coujard note that prostatic hypertrophy in the sense of adenomatous hypertrophy appears to be associated with dysfunction and senile changes in the genital glands, as it occurs not only in men in the older age periods but also in old dogs. For several years Heitz Boyer and his associates have advocated the treatment of prostatic hypertrophy by the administration of testicular hormone. They prefer for this purpose an extract of the whole testes of young animals; this extract is given by mouth and its administration may be continued for years without ill effects. This treatment results in the relief of dysuria and the disappearance of residual urine and sometimes in the diminution of the size of the enlarged prostate. In a large series of determinations of the hormones in the urine of men with prostatic hypertrophy the authors have found that there is a marked diminution of the male hormone in 6 of every 10 cases, practically complete disappearance of the hormone in 2 cases, and never an increase. In some cases the folliculin was reduced.

In the treatment of prostatic hypertrophy with male hormones it is noted that the urinary obstruction and resulting dysuria are relieved promptly while the size of the prostate is only gradually diminished. It has often been noted in cases of prostatic hypertrophy that the degree of urinary obstruction does not correspond to the degree of adenomatous enlargement. In radical removal of the prostate by Freyer's method it is evident that the smooth muscle of the sphincter is involved and it is this that causes the obstruction rather than the size of the lateral lobes of the prostate. In endoscopic resection it has been found also that the relief of urinary obstruction by this operation does not depend upon the amount of prostatic tissue removed but upon section of the median posterior fibers of the sphincter.

In the normal male it has been found that the blood vessels in the region of the verumontanum and the bladder neck are surrounded by an edematous

sheath This edema disappears in the castrate, but can be restored by the administration of testosterone or testicular extract This phenomenon is not peculiar to the prostate but has been observed also in the cock's comb and other secondary male sex organs which the male hormone acts upon This form of edema in the prostate and other secondary sex organs of the male is closely associated with smooth muscle fibers, and favors their relaxation and extensibility Thus, the authors maintain that the male sex hormones act upon the smooth muscle fibers of the vesical sphincter, and relieve urinary obstruction in this way, before their action on the prostate is evident The administration of male hormones may be preceded by endoscopic resection for the relief of obstruction, in this way the elasticity of the sphincter muscle is maintained after operation and the enlargement of the prostate is inhibited

Alice M Meyers

Oberholtzer, A *Synthetic Testicular Hormones, Their Physiological Action and Uses in Therapy, with Special Reference to the Treatment of Prostatic Hypertrophy* (Ormoni testicolari sintetici. Loro azione fisiologica ed impiego in terapia, con speciale riguardo alla cura della ipertrofia prostatica) *Arch Ital di urol*, 1938, 15 181

Butenandt extracted the first male hormone from urine, this was androsterone, which was later prepared synthetically The physiological activity of the synthetic product is such that from 0.150 to 0.200 mgm of the substance corresponds to one rooster unit The pure crystalline product melts at 178° C

Androsterone has an alcohol and a ketone group With acetic acid it forms an ether and it is a saturated compound because it does not add bromine or iodine Chemically it is a sterol and its empirical formula is $C_{19}H_{30}O_2$

Later studies led to the discovery of related testicular hormones which were subsequently prepared synthetically The various hormones possess the following physiological properties

1 Androsterone in large doses is capable of stimulating the growth of the comb in a capon A daily dose of 0.5 mgm over a period of twenty days triples the surface of the capon's comb As the treatment is discontinued the comb continues to grow for a few days and then decreases in size to reach its original dimensions in from two to three months In castrated rats, androsterone produces a marked enlargement of the seminal vesicles and of the prostate Synthetic androsterone is not destroyed in its activity when boiled with alkali Androsterone, as well as other male hormones, causes enlargement of the capon's comb when applied locally

2 Androstenolone has a much more marked physiological action than androsterone upon the capon's comb and upon the seminal vesicles of castrated male rats

3 Androstadiol is chemically the diol of androsterone obtained by hydrogenation It is about

three times stronger than androsterone in its action on the capon's comb whereas it acts only feebly upon the seminal vesicles of rodents

4 Di-hydro-androsterone has a much less pronounced physiological activity than androsterone

5 Androstendione is derived from di-hydro-androsterone by oxidation and it possesses the same physiological activity as androsterone with reference to the growth of the comb in the capon, but its activity upon the seminal vesicles of castrated male rats is much greater

6 Testosterone has a marked stimulating effect upon the comb's growth in capons and upon the seminal vesicles in castrated male rats According to some authors it is about seven times more active than androsterone

Of the various esters, the acetate and the propionate are most commonly used in practice, and further studies have revealed that the propionate is perhaps the most suitable preparation because its effect is rapid and prolonged Concerning the therapeutic applications of male hormones, the author states that they are found to be of value in the following conditions

1 Precocious senility and male menopause, characterized by headaches, gastro-intestinal disturbances, arterial hypertension, and psychic disturbances In Swiss and German clinics the results obtained are reported to be very satisfactory

2 In hyperthyroidism, diabetes, certain dermatoses, and alopecia, the administration of these products, either alone or in combination with other therapeutic measures, has proved to be of value

3 Male hormones have been used successfully also in certain disturbances of development including infantilism and in cryptorchidism

4 These hormones are also indicated in the treatment of dystrophia adiposogenitalis, disturbances of sexual power in the male, gynecostasia, extrarenal arterial hypertension, certain psychic disturbances, and disturbances in females past the menopause (artificial or physiological), as they offset the vasomotor symptoms and improve the psychic disturbances of the patient Some good results from the use of these hormones have also been reported in certain forms of sexual perversion

A very important application of male hormone therapy is its use in cases of prostatic hypertrophy The various investigators have unanimously agreed that male hormone therapy is very effective in the treatment of hyperprostatism, especially in cases of prostatic adenoma, whereas poor results are obtained with prostates presenting fibromyomatous lesions

It should be noted that a reduction in size of the adenoma should not be expected, however, the hormone arrests further enlargement of the gland if treatment is begun early It should be noted also that patients with hyperprostatism who have been treated with male hormone endure a prostatectomy much better than others in that healing occurs more rapidly and complications are aborted

In patients with hyperprostatism treated with male hormone the renal function is improved the symptoms are relieved and the residual urine gradually decreases

The preparation of choice in these cases is the propionate of testosterone given hypodermically in daily doses of from 5 to 10 mgm to be continued until the desired effects are obtained

ROTHARD E. SOMMA M D

Carli C Seminoma of the Testicle (Contributo allo studio dei seminomi del testicolo) *Tumors* 1938 24 245

Carli reports the case of a forty six year old man who underwent a simple orchidectomy because of an acute hematocele and hematoestis secondary to a tumor of the testis The patient remained apparently well until about nine months later when there was an explosively acute onset of multiple metastases The great extent of the involvement of the bones makes this report unique Also unusual was the acuity and precipitous nature of the spread in contrast to the usual late slow metastases

Histological examination of the metastases revealed tissue that bore a marked resemblance to the *Ewing sarcoma of bone* The explanation of this appearance of sarcoma like metastases arising from an epithelial tumor is not clear The author rejects the idea of metaplasia of the tumor tissue He suggests that the small pyknotic cells which are observed between the epithelial cell of seminomas and usually regarded as inflammatory cells may in

fact be part of the tumor These cells being more like connective tissue cells may readily have given rise to the sarcoma like metastases found in this patient

A LOUIS ROSE M D

MISCELLANEOUS

Vest S A Jr and Howard J E Clinical Experiments with the Use of Male Sex Hormones I The Use of Testosterone Propionate in Hypogonadism *J Urol* 1938 40 154

The authors give reports of 6 cases of hypogonadism and 2 cases of delayed puberty in boys in which testosterone was used for replacement therapy They have shown that the substance produces profound anatomical changes resulting in proportionate growth of the phallus scrotum seminal vesicles and prostate as well as the development of pubic axillary and extremity hair There were laryngeal changes the appearance of considerable prostatic secretion and an ejaculum with coitus Marked changes in the skin were noted In addition there were changes in the general appearance with improvement in the personality content Libido and potentia were induced in individuals in whom these had not existed previously and normal sex life was restored in a patient in whom impotence followed castration No evidence of increase in tolerance to the drug was noted

The author give a very complete review of the literature on sexual rejuvenation

D E MURRAY M D

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Kuth, J R Subacute Infections of Bone Osteoperiostitis Albuminosa Ollier *Arch Surg*, 1938, 37 46

Osteoperiostitis albuminosa is essentially a localized, indolent swelling consisting of periosteal, subperiosteal, parosteal, or intermuscular accumulations of clear, serous, stringy, or mucoid exudate. This exudate often resembles the white of an egg or synovial fluid. It has a high albumin content, is frequently encapsulated, and on culture may show the presence of ordinary pus organisms or staphylococci. The usual symptoms of infection are absent. An analogue is a form of osseous cyst showing similar characteristics, which because of its benign course may develop over years.

Of the reported cases in which the sex was indicated, 51 occurred in men or boys and 10 in women or girls. Eight patients were in the first decade of life, 26 in the second, 12 in the third, 9 in the fourth, 6 in the fifth, 3 in the sixth and 1, a woman aged 79, in the eighth. The femur was involved in 33 cases, the distal end in 19, the middle third in 8, and the proximal end in 6, the tibia in 21 cases, the distal end in 8, the middle third in 2, and the proximal end in 9, the humerus in 5 cases, the distal end in 2, and the proximal end in 2, the ulna in 4 cases, the distal end in 1, the middle third in 1, and the proximal end in 2, the radius in 1 case, the phalanges of the fingers in 2 cases, the ilium in 4, a rib in 1, and the skull in 1. There were 4 cases in each of which two bones were involved the femur and the rib, the femur and the humerus, the tibia and the ulna, and the tibia and the humerus.

The duration of the symptoms previous to the time of observation was noted as follows: from four days to one month in 12 cases, from one to two months in 9, from three months to one year in 13, from one to two years in 10, five years in 1, and from ten to twenty-nine years in 6.

The disease was identified in the reported cases only after aspiration or incision. In 32 cases the fluid removed was described as serous and stringy (yellow, clear yellow, serous, and purulent in 1 case each), in 11 as jelly-like, in 17 as serosanguineous (resembling jelly in 5 and purulent in 1), in 1 as resembling glycerine, in 2 as clear, and in 1 as milky white.

Schlange (1887), the first to report the results of bacterial examination of these exudates, obtained a growth of staphylococcus aureus in 1 case and a negative culture in another. Negative cultures have been reported in 6 cases. Positive cultures have been reported as follows: staphylococcus aureus in 11 cases, staphylococcus albus in 2, and staphylococcus without further specification in 2.

The collections of exudate have been reported as arising subperiosteally, intraperiosteally, and extraperiosteally. They have been seen free in the soft tissues with no definite encapsulation, and have been seen enclosed in a more or less definitely formed sac. At times the exudate is described as infiltrating the periosteum, muscles, and fascia, changing these structures into a succulent, soggy mass.

Many of these cyst-like formations, especially those near joints, strikingly resemble true cyst-like extensions from neighboring synovial structures. Therefore, some workers have questioned their origin from lesions of periostitis albuminosa.

The incidence of trauma and the part it plays in the causation and production of periostitis or osteoperiostitis albuminosa have been variously reported and interpreted in this series of cases. Among the cases in which trauma was mentioned in the histories, it was noted as absent in 32 and present in 16.

A review of the cases collected by the author shows that 93 per cent were periosteal or cortical in origin. In their tendency to involve the superficial bony structures, in their clinical course, and in their characteristic exudate, they differed from those of ordinary osseous infection. Only in their subacute course did they resemble the rarer forms of attenuated infection associated with the names of Brodie and Garre. For this reason the author believes that the name of Ollier should be associated with this form of chronic bony infection.

The indolent character of the process and the absence of the usual signs of infection in cases of osteoperiostitis albuminosa may cause diagnostic difficulties. When tuberculosis comes into the question, it can usually be recognized by means of roentgenologic study, examination of the tissue, or animal inoculation. Malignant growths have at times been suggested by the history of gradual onset and progression and by roentgenographic characteristics. Confusion in the diagnosis has occurred in cases of osteoperiostitis albuminosa with accumulations of synovia-like exudate when these accumulations were located in regions ordinarily the seat of ganglions and cysts. Aspiration and roentgen examination may clarify the picture.

The lesions are mild and benign. Simple incision with adequate drainage and removal of sequestra, whether or not the cyst-like structures are removed, usually leads to recovery within a short time.

The centrally located lesion of osteomyelitis albuminosa should be distinguished from the true bony cyst.

NORMAN C BULLOCK, M D

Jonsson, E · Arthropathia Mutilans (Ueber sogenannte Arthropathia mutilans) *Acta med Scand*, 1038, 96 28

In 1913 Marie and Leri described a peculiar syndrome, which they named "Main en lorgnette."



Fig. 1

It is characterized by a shortening of the phalanx of each finger due to a sort of melting of the epiphysis and at times also of the diaphysis. The skin and soft parts remain normal. The result of the abnormal relation between the skeleton and the soft parts is a folding up of the skin somewhat like the folding of an opera glass hence the name. In recent years similar cases were reported. These destructive changes were found not only in the hands but in the feet and exceptionally also in other parts of the skeleton. This discovery led to a change in the name to polyarthritis mutilans or arthropathia mutilans.

This syndrome was observed in cases of polyarthritis as well as in certain nerve diseases and apparently also in psoriatic arthropathy.

The case reports of Marie and Leri Weigeldt, Hochrein, Bulger, Stursberg, Reinhard, Schueller, Kienboeck, and others are discussed. The histories clinical entities and laboratory reports agree in a general manner but there is enough difference to justify the various terms suggested by the clinicians, pathologists and roentgenologists. The term osteo arthropathia mutilans comes closest to embracing all the various types of this disease as reported in the literature.

This disease is recognized by more or less destruction of the skeleton especially of the hand and feet with resorption of the epiphyses and of the contiguous parts of the diaphyses (Fig. 1). Histological examinations were made in a very few cases.

The pathologico-anatomical basis of this condition is evidently varied as there are inflammatory as well as non-inflammatory types. Apparently the morphological changes correspond to two clinical groups in as much as the inflammatory changes occur in cases of polyarthritis while the non-inflammatory changes occur in the nerve cases with mutilating arthropathies. At present it cannot be definitely

stated to which group the psoriatic mutilating arthropathies belong. Two case reports are given.

MATILAS J. SEIFERT, M.D.

Gray H. Sacro Iliac Joint Pain. Anatomy Morbidity and Treatment by Manipulation. *Int. J. Clin. Orth.* 1933 2: 54.

This article is the first of a contemplated series of three and deals with the finer anatomy of the sacro iliac joint as it is related to the subject of sacro iliac pain. The inspiration for these papers was obtained during the author's recent eight months' stay in London. Here he was somewhat astonished at the space given in the literature to this subject and at the caliber of the medical men who were practicing joint manipulation as a therapeutic aid. He contrasts this situation with that which exists in our country and quotes Sir Robert Jones who in 1931 blamed the medical profession for allowing this branch of work to fall into the hands of irregular practitioners. It was Sir Robert who suggested that joint manipulation should again be dignified and added to our armamentarium.

The author deals with the finest of the macroscopic detail of the sacro iliac joint after an introduction which suggests that one can obtain such information from only a few of the textbooks and articles extant. He describes and measures the little known protuberances and recessions of this joint and quotes and compares the works of the few authors who have done this in earlier times.

JAMES K. SACK, M.D.

Palmer I. On the Injuries to the Ligaments of the Knee Joint. A Clinical Study. *J. Clin. Orth.* 1939 8: Supp. 53.

Intra-articular injuries of the knee joint with negative roentgenograms constitute one of the most difficult diagnostic problems in surgery. This fact together with an opportunity of studying a number of these cases prompted the work upon which the author has based this article. He rightfully calls attention to the fact that the surgeon has come to rely on roentgen findings in cases of knee injury and the absence of these findings has caused him to be inclined to look lightly on the possibilities of serious damage.

In the 275 pages devoted to this treatise the author first covers the anatomy and physiology of the knee. Figure 1 is his schematic implication of the mechanism of this joint. One can see the condyles of the femur, the two collateral ligaments, the two crucial ligaments and the semilunar cartilages resting on the upper articular surface of the tibia. The structure, innervation and function of each component part of the knee is taken up with great thoroughness. All possible movements and traumas to which the knee could be subjected are discussed from the point of view of the effect on the working parts of the joint. With the principles in mind the author suggests the following for the examination of the knee.

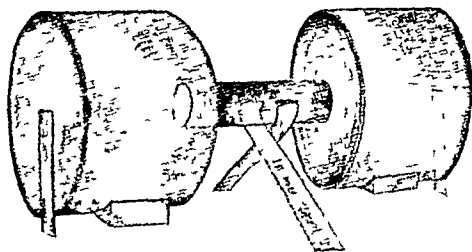


Fig 1 A schematic simplification of the knee joint



Fig 2 Roentgenologically portrayed abduction rocking in injury to the tibial collateral ligament. Thighs bound together and sand bag pressed between patient's feet

- 1 A complete history and careful interpretation of the mechanism of the injury
- 2 A comparison of the injured leg with the other, noting contour, size, muscular tone, and the like
- 3 A search for swellings, temperature variations, and the like
- 4 Palpation of the fat pad on each side of the patellar tendon, palpation of the attachments of the collateral ligaments, as well as of the anterior attachments of the menisci
- 5 A test of the range of physiological movement
- 6 Ruling out medial and lateral instability, as well as the integrity of the crucial bands
- 7 Roentgen-ray examination of the knee
- 8 Arthrography, if necessary

The details of interesting experiments done to throw light on the laws of mechanics as they affect the knee joint are given in a long chapter. While in a sense academic, the reading of this chapter aids the student in seeing the author's viewpoint. The following chapters are devoted to case histories, illustrating the clinical application of the work described earlier.

While this article is essentially surgical in nature, the author does not advocate promiscuous open repairs on all recent injuries of the knee. If one is able to make a diagnosis of a complete rupture of any of the intra-articular ligaments, then surgery is indicated. However, the majority of tears in these structures are partial, and complete recoveries are made with proper conservative management. In



Fig 3 "Drawer backwards" appearing spontaneously in a case of recent injury to the posterior crucial band upon flexion of the leg with the foot resting against the underlying surface. In the picture to the right the "drawer" subluxation is corrected.



Fig 4 "Drawer forwards" in recent injury to the anterior crucial band

those instances of long-standing ligamentous injuries which have resulted in an insufficiency of the part, open repair is usually necessary. This commonly entails substitution of a pedicle flap of fascia or tendon for the inadequate tissue present. The author stresses the fact that in such long-standing injuries the compensatory support offered by the muscles which move the knee may lull the patient and the surgeon into a sense of security. In such instances it is not likely that surgery can be permanently avoided, because this compensation cannot go on indefinitely, and if such is allowed, serious damage to the joint surface may take place. It is to be remembered in this connection that substitution operations after severe long-standing ligamentous damage to the knee, while stabilizing and effective at times, do not restore the knee to normal.

JAMES K. STACK, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Leveuf, J., and Bertrand, P. The Treatment of Severe Paralytic Talipes (Le traitement du pied talus paralytique grave). *J de chir*, 1938, 52: 145.

Leveuf and Bertrand discuss the operative treatment of severe paralytic talipes in which there is

bony deformity as well as compl to paralysis of the *triceps surae*. Two groups are distinguished in one only the muscles of the foot are involved in the other the paralysis extend to the leg especially the quadriceps.

In the treatment of their cases the authors have employed tendon transplantation in addition to surgical correction of the bony deformity.

The operation in such cases may be done in one or two stages. In the first case reported the operation for correction of the bony deformity was done first the tendon transplantation at a later date. In another case the tendon operation was done first but as the result was not entirely satisfactory correction of the bony deformity was done later. In most cases both operative procedures were carried out at the same time the authors consider this method most advantageous.

In this one stage operation a long arc shaped incision is made beginning behind the external malleolus passing around it and forward on the back of the foot. The peroneal tendons are isolated and sectioned. A double bone resection is then performed.

1. Anterior resection removing the head and a large part of the neck of the astragalus in the region of the cuboid the scaphoid and the calcaneum removal of the articular facets is sufficient. This resection largely corrects the talipes and makes it possible to push the calcaneum backward.

2. Posterior resection removing a wedge shaped section with the base at the back from the calcaneum which removes the projection of this bone that supports the posterior articular facet. In the region of the astragalus the articular surfaces are scraped. This resection permits the replacement of the calcaneus in normal position and completes the correction of the talipes.

With this method the scaphoid forms a dorsal projection that serves as a buttress. The fibro-peroneal planes are carefully sutured.

For tendon transplantation the peroneal tendons are employed either the peroneus longus or both peroneal tendons may be used but not the peroneus brevis alone. The *tibialis posterior* muscle is also used provided it is not involved in the paralysis. As a rule the tendons of both peroneal muscles and of the *tibialis posterior* are employed the tendons are detached at the point of insertion and a strong silk suture is placed at the detached end. The tendon are then drawn through a tunnel in the bone across the posterior and upper portion of the calcaneum by means of these silk sutures. The foot is placed in the desired position and the tendons fixed under moderate tension. If the paralysis of the *triceps surae* is only partial the *Achilles* tendon may be shortened but if the paralysis is complete this is not done. The foot is placed in a plaster cast for two months the cast is then divided to permit daily exercise but the child is not permitted to walk until the end of the third month. A shoe with an elevated heel should be used at this time.

The results of this operation have been very satisfactory in the authors experience. The anatomical correction is good and the functional results are also good. The transplanted muscles contract well, both on voluntary movements and the automatic movements of walking. Walking is always much improved and in some instances practically normal. Six illustrative cases are reported.

ALICE M MEYERS.

FRACTURES AND DISLOCATIONS

Golsman J and Compere E L. The Healing of Fractures of Atrophic Bones. *J Bone & Joint Surg* 1930 20 337.

Clinical studies were made of 10 cases of fracture and 77 cases of osteotomy in fractures of atrophic long bones of patients treated in the University of Chicago Clinics. It was impossible to compare accurately the rate or degree of healing as shown in the roentgenographic pictures of these patients. In view of the many variables present it was impossible to make a satisfactory scientific comparison or analysis. The impression gained however from the study was that union occurred as readily in fractures of atrophic bones as in fractures of bones of normal density. The osteotomies also healed promptly.

Experiments were performed on rats. The first was done for the purpose of observing the healing of fractures of the tibia in growing rats. A generalized wasting of bones in both adult and young growing rats was produced by marked reduction of the intake of calcium. The rate and degree of fracture healing in these animals were compared with those of animals on a normal stock diet or on a diet with excessive amounts of cod liver oil calcium or both. The results of these experiments showed that rats gained weight regardless of the type of diet and seemed to do equally well. In no instance did rickets develop. Roentgenograms showed a moderate but definite bone atrophy quite similar to local atrophy of bone resulting from disease. As estimated from studies of the roentgenograms of these living animals the rate of union appeared to be approximately the same in all groups but the quality of union and of the bone themselves was best in the groups receiving normal stock diet throughout the experiment. No definite change was brought about by the up-plement of cod liver oil or a combination of calcium and cod liver oil. Definite roentgenographic as well as microscopic evidence of bone atrophy was obtained in growing rats fed on low mineral diet.

The second experiment concerned the healing of fractures in adult rats.

The low calcium diet before fracture did not produce osteoporosis to the extent that it could be demonstrated in the roentgenograms. Roentgenographically and microscopically healing was shown to progress well in all rats.

The speed of healing of atrophic bone is at least not decreased but the total amount of callus is on the average less than in bone in which there are

more normal supplies of mineral salts. The union is only as strong relatively as the strength of the shaft of the bone which has been fractured. Fractures of the bone in either young or old rats on mineral deficient diet did not heal more promptly or more adequately when large amounts of Vitamin D or of calcium were added to the diet, in fact in some instances these supplements seemed to retard bone repair. These studies seem to indicate that there is a threshold of mineral and vitamin normalcy below which bones become atrophic. If Vitamin-D deficiency is marked, rickets also develop and fractures of the rachitic bones heal very poorly. If the deficiency is largely of the mineral element, bone may become atrophic with no rachitic changes and without affecting the rate of fracture healing, and the quality of union will be comparable to the quality of the bone fractured.

There is no good evidence that the addition of Vitamin D or of calcium to the average stock diet of experimental animals or to the well balanced diet of patients has any beneficial effect in the healing of fractures. The authors question the advisability of continuing the practice, now common, of prescribing massive doses of Vitamin D, or of Vitamin D and calcium, for fractures in patients with no evidence of deficiency of these elements.

RICHARD J. BENNETT, JR., M.D.

Biehl, M. The Treatment of Pseudarthrosis with the Use of a So-Called Flexible Bone Graft (Zur Behandlung der Pseudarthrose unter Verwendung eines sogenannten biegsamen Knochenspans) 62 Tag d. deutsch. Ges. f. Chir., Berlin, 1938

Those cases of pseudarthrosis that are not curable by simpler surgical measures, such as the drilling of Beck or the splintering procedure of Kirschner, should be treated by more extensive surgical procedures. In order that the success of these operations may be secured, they are often supplemented by the free autoplasmic transplantation of bone. The usual procedure is the use of firm, rigid, massive grafts of bone. The less frequent procedure is the transplantation of thin flexible grafts of bone and periosteum. This method seems to have great advantages.

The author developed a special procedure, which he illustrates first with the use of two amputated bones in a number of pictures. An osteoperiosteal flap with a thickness of from 2 to 3 mm. is chiselled from the healthy tibia, and completely splintered up into larger and smaller pieces, like fish scales, which are held together intact by the firmly attached periosteum. The size of the graft depends upon the size of the pseudarthrosis to be treated. For example, for a pseudarthrosis of the tibia a graft of almost the entire length and breadth of the anterior surface of the healthy tibia is chiselled off. Because of its numerous fragments the bone-periosteum graft rolls up spontaneously, with the periosteum to the inner side, and can be further rolled as desired. Small pieces of bone periosteum are then cut off from one

end of the flexible bone-periosteum graft, which serve the purpose of partially filling up the empty marrow cavity, which has resulted at both ends of the bone following excochleation of the occluding fibrous marrow into the healthy marrow. This is done on the assumption that from the healthy marrow a good marrow callus will proliferate from the inlaid bone-periosteum graft up to the actual site of the pseudarthrosis. The latter has been freshened with a Luer needle for the purpose of securing a good impaction, in which, under certain conditions a certain amount of shortening must be taken into account, and in a given case the fibula must be fractured or resected a little, so that the aim of complete accommodation of the free ends of the bone to the freshened site of the pseudarthrosis is easily accomplished and no defect between the two ends of the bone remains. The pseudarthrosis prepared in this way, according to the usual generally applied rules of the freshening of a pseudarthrosis, is sutured together with two wire sutures in two different planes, whereby the flexible bone graft is laid around the bone with the periosteum inward, so that it broadly surrounds the sutured bone site and the wire sutures fix the entire bone-periosteum cuff at the same time firmly *in situ*.

The author has treated 3 cases of pseudarthrosis according to the procedure described. The first case was that of an old pronounced pseudarthrosis of the tibia, in which the drilling procedure of Beck had already been tried without success. The pseudarthrosis, operated upon according to the directions given, was absolutely cured in the course of five months (as shown by roentgenograms). In the second case there was more delay in the healing of a fracture of the tibia, which was destined to lead to a pseudarthrosis. The operation, likewise carried out according to the mentioned procedure, which was done more for the prevention of an expected pseudarthrosis, led also to an absolutely definite healing of the fracture in five months (as shown by roentgenograms). The third case was that of a woman, fifty-six years of age, with a pseudarthrosis of the right femur, dating from the year 1935, and a pseudarthrosis of the left femur, dating from the year 1936. On the pseudarthrosis of the left femur, both the drilling procedure of Beck and a grafting of the bone were carried out in the year 1937 without success. In February, 1938, the author treated both pseudarthroses surgically at one sitting by freshening the fragments, in which he again applied the procedure of transplantation of the flexible bone graft to the right femur. The course of the wound healing was smooth. Nothing definite can as yet be said regarding the final outcome of the bone healing, two months after the operation. However, the roentgenographic controls, which were made during a change of the plaster cast after eight weeks, justify good expectations. The right femur, on which the free transplantation of the flexible bone graft was carried out, presents the formation of an abundant callus mantle (as shown by roentgenograms). (M. BIEHL) LOUIS NEUWELT, M.D.

tion at the margins of the vertebral body. Prognosis is bad in high thoracic dislocations with paraplegia, fair in cervical injuries and good in lumbar injuries.

In two thirds of the cases in which good reduction was obtained, there was complete absence of pain. In the uncontrolled series in which there was more marked deformity, almost every patient complained of pain.

There may be a slight narrowing of the disc space above or below a fractured vertebra which may be responsible for a trace of kyphosis even if there is negligible wedging of the bone.

Spurs represented unreduced fractures of the crushed vertebral bodies and were found to be present in more than half of the indifferently treated cases, while only 2 per cent of the cases in which good reduction was obtained showed this condition.

In wedge and comminuted fractures, 80 per cent of the patients resumed their original employment. Forty eight per cent of this group were engaged in heavy labor, while 32 per cent were artisans, light laborers or sedentary workers. The other 20 per cent maintained they were partially or totally disabled. The men engaged in heavy labor were incapacitated for an average period of ten months, while those in light employment returned to work in seven months. The plaster jacket was worn for from four to six months in most cases and then from

three to six months of treatment were necessary after the jacket was discarded and before recovery was complete. *Mental as well as physical injury* must be considered in estimating the duration of disability.

Cord damage may be sustained at the moment of injury or subsequently. Special precaution must be taken to avoid flexion of the spine during transportation. Excellent figures are included to demonstrate the fractures and the proper method of treatment.

The author's postural method of reduction and plaster fixation is quite simple. Although a plaster jacket has been applied, many fractures have never been reduced because the spine was not first hyperextended. A perfectly applied plaster cast extends from the symphysis pubis to the clavicles and displacement cannot recur whether or not the patient is ambulatory. The patient must be taught how to sit and lie down. In many cases a new jacket should be applied again in the position of hyperextension in from four to eight weeks after the original reduction. It is important not to remove the jacket too soon.

Two cases of hyperextension fracture are described.

Lumbar fracture dislocation with locking of the articular processes is described and the treatment outlined.

RICHARD J. BENNETT, JR., M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Craig, W McK, and Horton, B T The Diagnosis and Treatment of Vascular Disorders of the Extremities. *Surg Clin North Am*, 1938, 18 899

Raynaud's disease affects young women in more than 95 per cent of the cases. Because it is caused by vasospasm it is completely relieved, if uncomplicated, by complete sympathetic denervation of the vessels. Generally, the first symptom appears in winter and consists of changes in color, usually of all of the fingers or toes. The involvement is symmetrical. The changes in color are of the so-called three-phase type. Patients frequently note that the digits become white and dead with exposure to cold, and that when warm they become red, or often blue. When the patient is first observed the fingers and frequently the toes are of a cyanotic hue. These changes in color are excited more readily by emotional disturbances than by exposure to cold. The peripheral arteries of the involved extremities always pulsate normally. Hence, the pain of intermittent claudication never occurs in Raynaud's disease. Gangrene, when present in advanced cases, is limited to the cutaneous surface, in contradistinction to the mass gangrene which sometimes occurs in thrombo-angitis obliterans. In acrocyanosis the color changes are not symmetrical and only one or two digits are involved.

Raynaud's disease may involve the upper or lower extremities and occasionally the nose and lobes of the ears. Gangrene in Raynaud's disease differs from the gangrene which occurs when the vessels are occluded, in that it produces dry ulcers at the tips of the fingers or toes, with distorted growth of the nails, instead of complete gangrene of one of the digits. In certain cases the disease does not progress to the stage of trophic changes and the formation of ulcer, but scleroderma develops. Scleroderma manifests itself clinically by a tightening of the skin so that the skin itself has a smooth, glazed, ironed-out appearance. This is usually noticed in the skin of the fingers, hands, face, neck, and upper part of the thorax, or it may involve the feet and legs. It may even be more generalized. The muscles and bones may be included in the atrophic degenerative process. Scleroderma is the most troublesome complication of Raynaud's disease and the most difficult to treat.

At the present time surgical measures should be applied to the sympathetic nervous system only when the symptoms are progressive, when they incapacitate the patient, produce ulceration, or fail to respond to the simpler medical procedures. In uncomplicated cases of Raynaud's disease, denervation of the vessels of the lower extremities by removal of the second, third, and fourth lumbar sympathetic ganglia, and division of the communicating

rami have been followed in every case by complete relief of symptoms, but there has been some controversy with regard to the satisfactory method of denervating the vessels of the upper extremities. The entire question concerns the interruption of the preganglionic fibers and whether or not, following degeneration of the postganglionic fibers, there is a sensitization to adrenalin circulating in the blood. On theoretical grounds with consideration of White's experimental observations which seem to indicate that the denervated structure becomes hypersensitive to circulating adrenalin only when the postganglionic fibers have degenerated, the preganglionic operation would seem more likely to succeed, yet the results so far published do not provide evidence that this is always true in practice.

Although evidence has not proved conclusively, as yet, which operation is the one of choice, namely, preganglionic or postganglionic sympathectomy, if a permanent vasodilating effect is to be secured it is necessary to interrupt completely all vasoconstricting impulses traveling to the arteries, arterioles, and capillaries of a given extremity. The final choice of operation will depend on the results of the respective procedures. In view of the permanent vasodilating effect and the relief of symptoms in the lower extremities which can be obtained by lumbar sympathectomy, it seems logical to expect that similar results can be accomplished by sympathectomy in the treatment of Raynaud's disease of the fingers and hands. The results that have been obtained by extensive cervicothoracic sympathectomy, as it is employed at the Clinic, will justify the continuance of this procedure until a better operative measure has been introduced.

The incidence of erythromelalgia, as noted at the Clinic, is 1 to every 200 cases of peripheral vascular disease. Physiologically it is the opposite of Raynaud's disease. No specific treatment has been advanced for erythromelalgia. Administration of from 5 to 10 gr (0.3 to 0.65 gm) of acetylsalicylic acid frequently will relieve the pain for twenty-four to forty-eight hours. This is a valuable diagnostic procedure.

Thrombo-angitis obliterans occurs in adult life, has a predilection for men, and affects persons of all races. Among the cases observed, only 2 per cent of the patients were women.

More than 50 per cent of the patients who have occlusive vascular disease of the extremities give histories of intermittent claudication. Since intermittent claudication never afflicts persons with Raynaud's disease or erythromelalgia, the symptom practically means either arteriosclerosis with occlusion, or thrombo-angitis obliterans. Superficial phlebitis of the migratory type is present in about 30 per cent of the cases. It rarely, if ever, occurs in arteriosclerosis. Changes in color of the three-phase

type also occur in 30 per cent of the cases. In *thromboangitis obliterans* pulsations invariably will be absent in one or more of the usually palpable arteries of the extremities whereas in Raynaud's disease pulsations in the peripheral arteries are normal.

In more than 50 per cent of the cases in which gangrene occurs it is caused by avoidable injuries. All patients who have *thromboangitis* should stop smoking.

Patients who have occlusive vascular disease owing to or associated with arteriosclerosis should not be subjected to sympathetic ganglionectomy. It is important to determine if the disease is associated with any occlusion of the terminal vessels attributable to fibrosis.

The fever and the resulting vasodilatation induced by the intravenous administration of typhoid vaccine not only have been important in the treatment of *thromboangitis obliterans* but have aided materially in the selection of suitable subjects for sympathetic ganglionectomy.

Surgical treatment consists of removal of the sympathetic ganglia in the lumbar and cervicothoracic regions. In *thromboangitis obliterans* sympathetic denervation of the upper extremities is much more satisfactory than denervation of the lower extremities. The operation does not influence the obliterated main vessels; the increased flow of blood to the extremities is produced by denervation of the vessels of the collateral circulation.

In more than 90 per cent of the cases of arteriosclerosis with occlusion the patients are men who are more than fifty years of age. Since vasospasm is rarely if ever an element in the condition it is not affected by sympathetic ganglionectomy. Pulsations of the peripheral arteries of the extremities usually are diminished or absent. The treatment is entirely medical unless amputation becomes necessary. It is unwise to use typhoid vaccine intravenously in this group of cases.

An arteriovenous fistula may be congenital or acquired. If one waits for the development of a bruit and thrill the diagnosis will be missed in the majority of cases. The bradycardiac reaction is diagnostic when present but is more often absent than present. Brown first introduced the idea of removing blood from the superficial or regional veins; the finding of arterial blood in these veins being diagnostic. Horton extended this procedure to include the deep veins of the extremities as well as the internal jugular vein. Arteriography should be carried out before surgical intervention is attempted.

In aneurysms of the extremities the authors believe that arteriography should be carried out if it is feasible before surgical explanation of an aneurysm is undertaken. This should be done especially if the aneurysm is on an arteriosclerotic basis.

Vascular disorders of the upper extremities may be caused by cervical rib producing mechanical compression of the vessels and nerves in the supra-

clavicular fossa or such disorders may be associated with the scalenus anticus syndrome. Movements of the head, neck, and shoulder girdle which produce undue pressure on the brachial plexus and subclavian vessels are followed in time by pain in the neck, arm, and hand or by circulatory and trophic changes in the upper extremities. When a roentgenogram of the cervical portion of the spinal column reveals either unilateral or bilateral rudimentary cervical ribs the diagnosis is indicated but when the same symptoms are present and cervical ribs cannot be demonstrated the condition known as the scalenus anticus syndrome is suggested.

The symptoms of compression of the brachial plexus and subclavian artery are usually pain, atrophy, numbness, or circulatory change consisting of cyanosis, ulcer, and rarely gangrene. The pain may be sharp and lancinating or only a dull ache may be present. The pain usually follows the course of the nerves which leave the lower part of the trunk at the brachial plexus but occasionally it may extend upward to the shoulder and into the neck. The pain may be more or less continuous but it is invariably exaggerated by rotation of the head or by forceful downward pull of the shoulder. Atrophy occurs late and is rarely complete; it may be one of two types: the median or partial thenar type and the ulnar type.

Circulatory symptoms are rarely severe but they may manifest themselves in a dusky hue of the arm and hand as compared with the color of the opposite upper extremity. There may be associated mild trophic changes in the tips of the fingers. Gangrene involving one or more fingers has been known to occur; this usually is accompanied by obliteration of either the median or ulnar artery or both. Diminution in volume of the radial pulse is common; the volume of the pulse can be decreased or the pulse can be obliterated by having the patient elevate the chin or rotate the head to the affected side on inspiration.

In the operation it is important to carry the dissection upward along the anterior border of the scalenus anticus muscle for a distance of 5 cm. in order that the phrenic nerve be exposed thoroughly and may be dissected free before it is retracted medially. The fibers of the tendinous attachment of the scalenus anticus muscle at its insertion are then divided care being taken that the subclavian artery and pleura are not injured. As soon as the scalenus anticus muscle has been divided the subclavian artery can be dissected free and will then drop forward. After the scalenus anticus muscle has been divided the cervical rib is carefully examined and if it is causing no pressure from behind no further surgical procedure is necessary. However if the cervical rib or a tendinous attachment to the first rib seems to be compressing the brachial plexus from behind a portion of the rib and tendon can be removed with a rongeur forceps. In cases of scalenus anticus syndrome resection of the scalenus anticus muscle, all that is needed.

Arteritis of the temporal vessels is a non-fatal disease that is characterized by periarteritis and arteritis of the temporal vessels, painful, tender areas over the scalp. It is accompanied by headache, general malaise, lassitude, weakness, fever, night sweats, anorexia, loss of weight, anemia, and mild leucocytosis. It generally affects elderly persons. The etiology is unknown. The prognosis for immediate recovery is good. The disease seems to run a course of several months' duration and to subside gradually. Symptomatic treatment along general lines should be carried out.

Most stonecutters who use the pneumatic hammer have a disturbance of the circulation of the hands. It consists of blanching and numbness of certain fingers when they are exposed to low temperatures. The disturbance may simulate that of Raynaud's disease, but the history, sex, lack of involvement of the feet, and the practical absence of trophic changes serve to distinguish it from Raynaud's disease. A similar condition has been noticed among shoemakers who use a different type of vibrating machine.

There should be no difficulty in distinguishing pneumatic-hammer disease from Raynaud's disease and thrombo-angitis obliterans. Pneumatic-hammer disease occurs exclusively among males, or among persons who use the hammer, whereas Raynaud's disease is almost entirely confined to females. The arterial pulsations of subjects who have pneumatic-hammer disease are normal, but in thrombo-angitis obliterans one or more of the usual palpable arteries of the extremities is occluded. It should be pointed out, however, that since the use of arteriography for the visualization of arteries, one occasionally sees a case in which early thrombo-angitis obliterans is confined to the digital arteries of the upper extremities, so that the arteriogram, as well as the general clinical picture in thrombo-angitis obliterans, may simulate that of pneumatic-hammer disease. Massive gangrene does not occur in pneumatic-hammer disease. Trophic changes among pneumatic-hammer workers are relatively rare, even after they have worked at their occupation for years. The disease tends to run a benign course.

Laewen, A. Further Experiences with the Surgical Removal of Thrombi in Cases of Thrombosis of the Veins (Weitere Erfahrungen ueber operative Thrombenentfernung bei Venenthrombose). 62 *Tag d. deutsch. Ges. f. Chir.*, Berlin, 1938.

The author exposed the thrombosed femoral and external iliac veins up to the confluence of these

veins with the hypogastric vein and blocked the descending main vein above the end of the thrombus. He removed the thrombi by opening the femoral vein, then he released the superior block of the vein and closed the opening in the vein with a continuous suture.

The surgical removal of non-infected thrombi from the large retroperitoneal vein and the femoral vein should prevent the occurrence of a pulmonary infarct or pulmonary embolism, should correct or reduce the peripheral stasis, and, further, should completely diminish the arterio-spasm which is more or less prominent in every case of massive venous thrombosis. The operation is indicated when either a second pulmonary infarct or a single severe pulmonary infarct takes place, thus directly endangering life, when an acute massive venous thrombosis with symptoms of attendant arteriospasm occurs, or when there is a thrombotic blocking of the descending main vein which produces considerable congestion and edema but no pulmonary infarct. One should operate only when the precise location of the thrombus is determined. A successful operative result depends upon the limitation of the thrombi to the previously mentioned veins and upon the possibility of complete removal of the thrombi. The author reports success in 2 of 3 new cases. He describes the excellent effect of surgical removal of a thrombus in a woman thirty-five years old in whom a thrombus of the left femoral vein appeared six days after appendectomy, twenty days after the operation a temporary left facial paresis occurred during a brief period of unconsciousness, thirty-one days later there was a sudden collapse, and three days thereafter a pulmonary infarct. A thrombus 12 cm long was removed from the femoral and external iliac veins of the left leg. The femoral artery was found to be definitely narrower than normal during spasms. The embolism did not recur, and the patient was out of bed within eighteen days, being discharged from the hospital thirty-six days following the removal of the thrombus. The congestion of the left leg diminished.

The blood pressure in the femoral vein will be found to be positive. In all cases in which the author performed thrombectomy and the thrombus was found to be non-infected, the author discovered such signs of inflammation as edema, periphlebitic thickening of the wall, and swelling of the lymph nodes in the region of the descending, thrombosed main vein. This inflammatory process also caused the formation of thrombi in postoperative thrombosis.

(LAEWEN) NOAH D. FABRICANT, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Fuge W W and Hogg B M The Insensible Loss
In Surgical Patients *Ann Surg* 1938 108 1

In order to investigate further the insensible loss in surgical patients the authors undertook to weigh all intake and output from 12 surgical patients and to calculate from these weights and the change in weight of the patient the insensible loss. They pointed out that if the perceptible output plus the final weight of the patient was subtracted from the initial weight plus the total intake the difference would represent the insensible loss. This loss has been shown to be from 85 to 100 per cent water vapor depending upon the nature of the food taken. Because the body temperature activity in bed and caloric exchange could not be controlled several twenty four hour periods were required in the study of each patient.

The results of these studies were carefully plotted and given in detail. The average loss which was found to be from 1154 gm to 1830 gm was directly proportional to the size and weight of the patient. Exceptions were noted in the cases of 2 patients both were somewhat obese and had a rather obvious metabolic disturbance. In both cases the insensible loss was lower than the size of the patient would indicate. Patients with hyperthyroidism showed an abnormally high loss pre-operatively which fell to the expected level after correction of the metabolic disturbance by thyroidectomy.

A case is reported in detail to illustrate the effect of total diuresis of the insensible loss. In this case the fluid requirements of the patient were calculated from the urinary output and severe dehydration and shock were the result. Recovery followed the restoration of the water balance.

In this series 39.4 per cent of the output of patients was found to be represented by the insensible loss a quantity comparing with the loss from urination.

It is pointed out that if dehydration is to be avoided rather than combated adequate provision must be made to cover the losses including the insensible loss. It is impractical to determine the insensible loss of each surgical patient but a reasonable estimate can be made from the size and weight of the patient. Only by recognition of the clinical importance of the insensible loss can replacement be made according to the physiological requirements of the surgical patient. THOMAS C DOUGLASS M D

Brown J B The Repair of Surface Defects of the Hand *Ann Surg* 1938 107 952

This is an excellent illustrated summary of the principles used in the care of surface defects of the hand drawn from a large representative series of

cases. The author emphasizes the importance of the use of free grafts rather than pedicled flaps because of the simplicity and very satisfactory results obtained in the use of the former. The latter are reserved for repair when deeper structures such as a nerve tendon joint and bone are exposed. He suggests one fundamental rule namely that in a kinetic region such as the hand a full thickness loss of skin should be restored as completely and as early as possible.

The first group of hand defects discussed are those due to burns both superficial and deep. The author advocates free drainage of the injured area by moist or greasy dressings and very gentle débridement followed by early repair of the injured area with split skin graft from the thigh. In late unhealed burns the first object is to eliminate infection by covering of the raw surface after which the hand can be opened for correction of the deformity. Likewise scar contracture can be dissected with little or no exposure of tendons and the defect covered with a split graft. Even a partial restoration of function by the repeated excision of scars which are replaced each time with split grafts is worth while to make a use less hand one of some service. The author discusses the use of full thickness grafts on the hand when there is widespread and clean dissection of an extensive scar.

In the replacement of palmar tissues where there is no exposure of deep structures the advantage is a free graft rather than a pedicled graft. The latter will not furnish a more durable palmar skin for grafted skin always retains its original character.

The author describes the preparation of the bed for full thickness grafting with illustrations of the freeing of the scar the gradual stretching of the tendons the fixation of the hand the cutting of the graft with a pattern the application of the graft the final dressing and postoperative care. He presents a case of a split graft applied in infancy which grew as the hand developed and showed no evidence of failure to keep pace during the nine years following its application.

The author describes the care of roentgen ray burns of the hand and advises the use of a free split thickness graft to repair the defect following excision. The use of a full thickness graft is too hazardous a procedure in these burns.

There is one remarkable case of a complete amputation of the finger tip which the author successfully repaired by replacing an accurate suture of the severed tip.

The repair of web fingers is described. A large flap from the dorsum is turned downward to form the normal web and split grafts are applied to the raw surface on the sides of the fingers. The two sides of the finger are never done at the same time.

Flaps raised by laundry machinery are usually large dorsal flaps. Many can successfully be replaced, some may have to be repaired with free split grafts or pedicled grafts at a later date. As mentioned above, pedicled grafts are used where there is extensive exposure or destruction of the deeper tissues. The author describes two cases thus treated, one a shotgun wound and the other an extensive infection. He concludes with a brief discussion of physical therapy methods in rehabilitating the hand, emphasizing the importance of the motion in the metacarpophalangeal joint.

BRADFORD CANNON, M D

Dougal, D. The Etiology of Thrombosis and Embolism. *J Obst & Gynaec Brit Emp*, 1938, 45 425

Statistics bearing on the incidence of thrombosis and embolism are too variable to be of any value, but it is evident that if the minor degrees of these conditions are excluded, it will be found that these complications occur much more frequently than is generally supposed. Thrombosis and embolism are most likely to occur after abdominal operations, particularly hysterectomy for fibroids, but vaginal operations are not immune and carry an incidence of these complications which exceeds 50 per cent of that found in abdominal cases.

There can be no doubt that tissue-disintegration products play an important part in the origin of thrombosis. Although thrombosis occurs most frequently in puerperal and postoperative cases, it is also found after fractures, in malignant disease, and during recovery from acute infections, such as typhoid fever or pneumonia, in all of which conditions absorption of disintegration products is taking place.

The evidence that a mild degree of infection is one of the chief causes of thrombosis is extremely convincing. The rise of temperature and pulse rate so frequently observed before the thrombosis declares itself, and the more severe pyrexia and constitutional disturbance seen when the swollen limb or pulmonary infarction has made its appearance, can rarely be attributed to any other cause. There are, however, cases of severe and even fatal pulmonary embolism which develop within twenty-four hours after an operation and before a mild secondary infection is likely to have developed.

There seems to be general agreement that labor or a surgical operation is followed by definite changes in the composition of the blood. These changes are extremely complex, but taken as a whole they mean only that the altered blood may coagulate more readily *in vivo* and more quickly *in vitro*. Some other factor must be present before intravascular clotting can occur.

The importance of slowing of the circulation in the production of thrombosis and embolism is undeniable, and has been amply proved by the reduced incidence of these conditions among patients whose circulation has been speeded up by puerperal and postoperative exercises. That stasis is not a primary factor is shown by Hunter's classical experi-

ment in which he found that clotting did not occur in a length of jugular vein ligated at both ends, and also by the fact that mere recumbency or lack of movement does not result in thrombosis, apart from operation.

Injury to the vascular endothelium is undoubtedly an important cause of intravascular clotting, and, since vessels have to be clamped and tied in the course of most surgical operations, this factor must also be considered as a possible cause of postoperative thrombosis. There is no evidence, however, that the thrombotic process actually starts in vessels which have been damaged in this way, and it is more probable that the endothelium of the thrombosed vessel is injured as a result either of infection of the wall or of changes produced in the circulating blood.

Conditions in the lungs are extremely favorable after operations for the occurrence of thrombosis, and it may be that the majority of deaths from vascular obstruction are due to this cause. It is difficult to understand, however, why a gradual process like thrombosis should give rise to such sudden and severe symptoms. With regard to pulmonary embolism, there seems to be no doubt that the clot usually originates in the pelvic, iliac, or femoral veins, and that in the majority of serious cases the thrombosis is of the occult type. As most of these cases terminate fatally, it is quite possible that the clot became separated at an early stage before clinical thrombophlebitis had time to develop.

The main problem in the etiology is to discover why intravascular clotting is liable to occur after labor or surgical operation. It is quite certain that no single factor is responsible. The two primary causes of thrombosis are tissue breakdown and sepsis. The most important secondary factor is venous stasis, and its presence is usually necessary because thrombosis rarely occurs if the blood is flowing rapidly.

SAMUEL KAHN, M D

ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Wilson, W. C., Macgregor, A. R., and Stewart, C. P. The Clinical Course and Pathology of Burns and Scalds Under Modern Methods of Treatment. *Brit J Surg*, 1938, 25 826

The authors divide the clinical course of burns into five stages: (1) initial shock, (2) secondary shock, (3) acute toxemia, (4) septic toxemia, and (5) healing. They first discuss the theoretical considerations with regard to the causes of systemic disturbances and death following burns. It is believed that the local loss of plasma in the burned area is sufficient to produce a pronounced fall in the blood volume and that this factor is probably the chief cause of the shock, which is the first stage of the clinical course of burns. Other theories are discussed.

The second stage is toxemia, which may continue until the fourth or fifth day of the burn. Three

mechanisms are considered the action of toxins formed in the burned area, an hydrema or an increased concentration of the blood and finally bacterial infection of the burned area. The present trend of opinion seems to be that increased concentration of the blood is the main if not the only cause of the symptoms in the toxemia stage of burns.

The third stage is that of sepsis. Bacterial invasion of burned areas is of frequent occurrence but the factors in dispute are the time of onset of the sepsis and the frequency of serious infection.

The diagnosis of initial shock was restricted to the condition of low blood pressure in patients who were admitted to the hospital within two hours from the time of injury. In a series of 35 cases some of which were extensive and severe, initial shock was present in only 5; the condition was severe in 2 and mild in 3. Despite the presence of shock there was no noteworthy change in the blood chemistry or sedimentation rate. As a rule the hemoglobin content of the venous and capillary blood was normal. A leucocytosis was frequent though not invariable.

As examples of secondary shock, the authors include the cases of patients in whom shock developed subsequent to admission and also cases of patients in whom hypotension was already present at the time of admission, two hours or more following the injury. In most instances secondary shock began during or immediately after local treatment and developed rapidly. The clinical picture was that of surgical shock. The capillary blood usually showed a distinct rise in hemoglobin content; there was no constant change in the blood chemistry and even the carbon-dioxide combining power was rarely lowered. The incidence and degree of secondary shock were closely related to the extent and depth of the skin surface which had been injured.

Acute toxemia was frequently absent or very mild. Severe cases of acute toxemia resembled an overwhelming intoxication and showed a very constant and characteristic course in children. The onset was gradual and apparent at any time between six and fifty hours after the injury. The first sign was usually vomiting and simultaneously a disturbed mental state occurred which varied from listlessness to irritability. Sleep was very fitful and often interrupted by jerking movements of the limbs. As a rule hyperpyrexia was persistent and progressive. Circulatory failure was common; cyanosis often marked and the pulse became progressively more rapid and feeble. Blood pressure changes were variable and respiration was usually not affected. Even in the severe type of toxemia there were no constant changes in the blood concentration nor was there any direct relationship apparent. Common changes noted in the blood chemistry were a diminution in chlorides, carbon dioxide combining power and plasma albumin and a rise in the non-protein and urea nitrogen. These changes were neither constant nor proportional to the severity of the systemic disturbances. Abnormal constituents of the urine were variable. Cultures both

aerobic and anaerobic were taken from representative areas and showed no growth up to ninety hours. Hemolytic streptococci were frequently found to be present when there were no signs of toxemia and conversely there was no growth of bacteria in some of the severe cases. There was not the slightest indication that bacteria were a factor in producing the toxemia.

Acute toxemia was found to be less distinctive in adults than in children and the survival was more prolonged. Circulatory failure was less common in adults and the blood changes were similar to those found in children. Acute toxemia was more common in infants and young children than in adult. The relation between the extent of skin surface involved and the severity of the acute toxemia was less constant than the relation between the skin involvement and secondary shock. The fourth stage of burns that of septic toxemia is divided into superficial and deep burns since the incidence of infection was very intimately related to the depth of injury. During the first week incisions were made through the coagulum of superficial burns but there was seldom any evidence of bacterial growth up to ninety hours. Subsequently various organisms appeared in cultures taken from the burns although both local and general signs of inflammation were often absent. Gross or dangerous infection of superficial burns was rare.

In deep burns bacterial invasion was heralded by local and general signs. The local signs were usually obvious and the site of invasion was as a rule at the edge of the burn. Not infrequently the inflammatory process was more extensive in the adjacent unburned tissue than in the burned area. The general systemic disturbance proved the more reliable index of bacterial activity and was denoted by a swinging temperature, rapid pulse and signs of pyemia. Serious infection was usually caused by the hemolytic streptococcus. Local signs of bacterial infection of deep burns were rarely present before the fifth day and usually were not obvious before the seventh day. Even in fatal septicemia the hemolytic streptococcus did not appear in the blood before the ninth day. As regards incidence, if we assess bacterial infection by the results of cultures from the exudate beneath the coagulum, then infection was always present in deep burns during some part of their course, yet the degree of infection in the majority of cases was mild.

The complications of burning injuries are considered separately. Lesions of the respiratory tract were common after burns which involved the anterior aspect of the upper part of the trunk and face. These lesions of the respiratory tract were caused by direct injury to the lining membranes by inhalation of flame, hot air or hot fluid. The common lesions were bronchitis, bronchopneumonia and pulmonary edema and they were important contributory causes of death during the first and second week.

Ulcers in the duodenum were found post mortem in 4 cases and in the case all injuries were very extensive and deep and the time of death was between the

tenth and twelfth day Possible etiological factors are discussed

With increasing experience, the authors regard jaundice as one of the signs rather than a complication of acute toxemia Jaundice was found as early as forty-eight hours after injury, but appeared usually about the fourth day The jaundice was not related to therapeutic measures or infection and, in most instances, was excluded Jaundice indicated the occurrence of degenerative and necrotic changes in the liver

Pathological investigation was carried out in 33 fatal cases Six patients who died within twenty-four hours were examined and in 2 of these infiltration of the liver and other organs with eosinophilic leucocytes was found Pallor was the outstanding feature in most of the organs although organs such as the brain, lung, and spleen were sometimes moderately congested Fourteen cases of death occurring between twenty-four and one hundred hours after the burn were investigated In general this period may be regarded as that during which severe fatal toxemia proved fatal There was but 1 case of bacterial infection, the pathological changes were therefore characteristic of acute toxemia of burns Apart from striking changes in the liver, no organ showed any constant feature Changes in the suprarenal glands were very inconstant Thirteen cases of death after one hundred hours were investigated Eight of these showed the characteristic changes of sepsis, while the remaining 5 showed changes similar to those found in rapidly fatal toxemia

The most constant and characteristic feature of the pathology of burns was liver necrosis and degeneration In its earliest form, at twenty-one hours after injury, it appeared as fatty degeneration of the epithelial cells surrounding the efferent veins in the central zone of the hepatic lobules At a more advanced stage, from fifty-seven hours onward, the severe form of damage was found Grossly, the liver was enlarged, light yellow, soft, greasy, and friable On cut surfaces the lobular working was obvious, because of the greater pallor of the central zone Varying degrees of necrosis of the cells of the central part of the lobules were seen microscopically From a consideration of the earlier changes, it is clear that the process was primarily a degeneration leading to necrosis of the parenchyma cells This differed from the changes in the majority of bacterial toxemias There is a very close relationship of the liver lesion to acute toxemia, and in 14 of 16 cases of severe or prolonged acute toxemia the liver suffered intense damage That some degree of liver damage was sustained in a number of patients who survived was indicated by the occurrence of jaundice

In conclusion the authors state that a characteristic lesion of the liver cells was found after death from burns Its relationship to acute toxemia was so close as to leave little doubt that liver lesions and acute toxemia were produced by the same mechanism The responsible agency was certainly

not bacterial infection, and the liver lesion furnished the strongest indication of a non-bacterial toxin circulation during the first few days after a burn It has been shown that toxin formation occurs in burned areas as the result of autolysis of injured tissue Admittedly the final link in the chain of evidence is still missing, namely, the demonstration of the toxin in the circulating blood during acute toxemia It is possible that the action of the toxin is selective or that it becomes concentrated in the liver There is a very complete description of illustrative cases, and a discussion of treatment with consideration of the findings

HARVEY S ALLEN, M D

Bonney, V., Box, C., and MacLennan, J. Tetanus Bacillus Recovered from Scar Ten Years After Postoperative Tetanus *Brit M J*, 1938, 2 10

The authors report the case of an unmarried woman who in 1928, at the age of thirty-one, was operated upon at the Royal Masonic Hospital of London Fifteen days after myomectomy for uterine fibroids, she developed the typical clinical features of tetanus Following intensive serum therapy she made a complete recovery Although the discharge from the uterus and the unused remainder of the suture material were examined for clostridium tetani, this organism was not found and the diagnosis therefore rested upon the clinical picture, which was unmistakable

Early in 1938 the patient again presented herself because of a large recurrent mass of fibroids In view of the history of previous infection with clostridium tetani, a prophylactic dose of anti-tetanic serum was given prior to operation, which this time consisted of subtotal hysterectomy At operation the entire thickness of the original operative scar was excised Following operation two prophylactic injections of anti-tetanic serum were given The patient made an uneventful convalescence

A portion of the uterine wall and two strips of scar tissue which included the skin and the entire thickness of the abdominal wall were minced and inoculated into a series of tubes of meat medium and glucose blood broth These were incubated anaerobically for forty-eight hours at 37 degrees C After four days all cultures from the operative scar yielded a growth of clostridium tetani The cultures of the uterine wall yielded no clostridium tetani after one month's incubation The intramuscular injection of 0.25 c cm of a twenty-four hour broth culture of the organisms produced spasm and death of the experimental mice in from twenty-four to forty-eight hours, while the preliminary injection of a similar amount of anti-tetanic serum invariably afforded complete protection By agglutination tests, the organism was demonstrated to belong to Tulloch's Type III

Comparatively early in the study of the bacteriology of tetanus it was realized that the spores of the bacillus had great powers of resistance Eiselsberg in 1888 reported that a splinter of wood which

had caused tetanus in a boy was capable of infecting rabbits two years later. Henricjean in 1891 recorded similar results after an interval of eleven years. In 1931 Ernst reported a case in which tetanus developed fourteen years after the patient had been wounded in the World War a wound having remained imbedded in the wound. After a crushing injury of the hand during which the skin remained unbroken the patient developed tetanus. In this instance the spores presumably had lain dormant in the wound during the intervening years.

The authors conclude by emphasizing the importance of taking anti-tetanus precautions when operating upon a patient who previously has had tetanus even after a lapse of many years.

ARTHUR S. H. TUCKOFF, M.D.

Gold H. Active Immunization Against Tetanus by Means of Tetanus Toxoid Alum Precipitated Refined. *J. Lab. & Clin. Med.* 1938 23 903

A number of investigators among them Bergey and Etris Jones and Moss Gold Hall and Mc Bryde and Cowles have recently demonstrated that the injection into human beings of two doses of alum precipitated tetanus toxoid is followed by the appearance in the blood of appreciable quantities of tetanus antitoxin. What is more these injections can be given with safety and without the development of unpleasant reactions. There exists however considerable variability with regard to the amount of tetanus antitoxin produced and the persistence of this antitoxin in the blood. Race, sex or age seems to have no bearing on these two factors. There seems rather to be some relation to the individual constitution and the state of health of the host at the time of antigenic stimulation.

The studies and extensive experiments carried out by the author and other investigators are of great importance in the establishment of a possible means of active immunization against tetanus. Up to this time there has been considerable limitation of active immunization against tetanus as brought out by the author's study. However work such as this is of great importance and will no doubt eventually lead to complete protection against tetanus by active immunization.

In analyzing the published data on the subject the author states that several important questions must be answered before active immunization against tetanus can be recommended as a routine procedure. First among these questions is: What is the minimal titer of tetanus antitoxin that will protect an actively immunized individual against infection with clostridium tetani?

With reference to this question there are two means of experimental approach: (1) protection test in actively immunized laboratory animals and (2) studies of antitoxin titers in passively immunized human beings. In this connection it must be borne in mind however that while results obtained with experimental animals may provide a most convincing criterion of attainment in the laboratory it is possi-

ble that such findings are not directly transferable to the human being.

In a series of experiments carried out on guinea pigs by Sneath and his co-workers in 1937 it was found that many discrepancies existed with regard to the amount of protection afforded by given amounts of antitoxin. These suggest the possibility that antitoxin *per se* is not the sole factor influencing protection against the lethal spore dose. They conclude that once infection with clostridium tetani is a localized process it is probable that such an antitoxic level (0.05 unit) as will prevent the manifestation of tetanus in guinea pigs would also be sufficient to prevent the disease in man.

Cowles carried out a similar type of experiment on actively immunized guinea pigs and mice. From his experiments Cowles concluded that although it is probably impractical to define the minimal titer which will assure protection against tetanus antitoxin values of 0.10 or 0.20 unit per cubic centimeter of serum can give a fairly certain protection in immunized guinea pigs and mice at the time of infection. He believes that though 0.10 unit is not sufficiently great to protect all animals against a maximal infection it is probably much larger than necessary to care for many infections resulting from wounds that are judged to be too slight for surgical attention and it is probably sufficiently large to care for the majority of injuries which receive surgical treatment. He asserts that pending the acquisition of more information conservative opinion may demand the maintenance of such a titer in cases where much reliance is to be placed on the immunity.

The author's studies on passive immunization confirm the experimental findings of Cowles. Prophylactic passive immunization with 1500 units of tetanus antitoxin has been successfully used to prevent lockjaw following injuries in both war and civil life. Titrations following the injection of such a prophylactic dose reveal the presence of 0.1 to 0.35 units of antitoxin per c.c.m. of blood serum. Hence to be of value active immunization must at least produce 0.1 unit of antitoxin per c.c.m. This minimal protective value does not appear to the author to be too high since he has on several occasions encountered control values of more than 0.05 unit of antitoxin in persons who were never immunized passively or actively and who would consequently be considered susceptible to tetanus. Until direct proof exists that a lower antitoxin level is sufficient to prevent tetanus one must insist on the presence of 0.1 unit of antitoxin per c.c.m. of blood serum in order to consider an actively immunized person protected against this disease. The author states that from his experience with human beings a 1 c.c.m. dose of tetanus toxoid is more effective than smaller quantities of this antigen.

Another important question arising in this connection is: What interval of time should elapse between the two injections to obtain the best antitoxin response? The author has found that when the doses are given close together at an interval of

one month or less, the antitoxin titer that follows is not as high as when injections are made at an interval of ninety days. He adds that in most individuals the first injection of toxoid serves to prepare the host so that after a suitable lapse of time the administration of the second dose is followed by a rather prompt appearance in the blood of an increased amount of tetanus antitoxin. This interval should preferably be three months. Experiments conducted by the author showed that a protective antitoxin titer of 0.1 unit or more develops in from five to fourteen days following the injection of a second dose of alum toxoid, even when the latter is given two years after the first dose.

Besides determining the rapidity of development of the protective titer of 0.1 unit following the injection of the second dose of tetanus toxoid, the author attempted to ascertain the duration of this protective titer. A series of experiments conducted on adult workers established the fact that the duration of the protective level of antitoxin varies a great deal. It may disappear within ninety days after the second injection or it may last over two years.

Further experimentation brought out the fact that the antitoxin titer can be raised to a protective level by the injection of a third dose or subsequent doses of alum toxoid. A period of from five to seven days or more elapses after the "repeat" injection of toxoid before there appears 0.1 unit of antitoxin in the blood of actively immunized persons. Here again there is variability in the duration of the immunity that develops following the injection of a "repeat" dose of alum toxoid. It may drop below 0.1 unit in from three to six months after three or subsequent injections.

In view of these findings the author adds that if an injury occurs during the interval that elapses before the basic course of immunization is completed, and within a few days after the second or subsequent injections of alum toxoid when the antitoxin level of the blood has not as yet reached 0.1 unit, it may be necessary to resort to passive immunization in order to insure full protection against tetanus.

The author states that more experimental data are necessary to determine the actual amount of antitoxin necessary to protect an individual against tetanus. He suggests that field work, possibly in war zones, rigidly controlled to satisfy statistical requirements, would be of great value. In its present status, active immunization may prove to be of value in military service and in certain phases of civil life where injuries occur repeatedly. It will also prevent the occurrence of "delayed" or so-called "chronic tetanus."

MATHIAS J. SEIFERT, M.D.

Aubertin, E. *The Prophylaxis and Treatment of Serum Reactions* (Sur la prophylaxie et le traitement des accidents sériques). *J de méd de Bordeaux*, 1938, 115, 457.

Aubertin states that there is no absolutely certain method of preventing immediate or late serum reactions, and, therefore, serum therapy should be

employed only when it is indispensable and there is no doubt of its efficacy. In practice, it is not always easy to follow this rule, as for instance in cases of injury in which tetanus is a possibility, or in cases in which the diagnosis of diphtheria is not definitely established. There are other conditions in which the value of serum therapy has not been entirely established, such as pneumonia. Serum therapy is to be avoided especially in the cases of patients who show any signs of allergy.

When serum therapy is definitely indicated, it is important to determine whether the patient has ever been given serum previously and whether he has ever shown symptoms of intolerance. Intradermal or ophthalmic tests with horse serum diluted 100 times may be made. If the history is negative and these tests are negative, the danger of any immediate anaphylactic reaction is slight. However, when the history is indefinite or if the tests are not made, as is often the case, certain precautions should be taken to avoid the more severe reactions.

First, an hour before the first injection of serum, ephedrine should be given by mouth: 1 cgm for children from one to four years of age, 2 cgm for children from four to nine years of age, 3 cgm for older children up to fifteen years of age, and 4 cgm for adults.

A few cubic centimeters of serum should be given at first, and the rest of the dose a quarter of an hour later. If there is any doubt as to previous sensitization of the patient, either Besredka's method of fractional doses may be employed, or $\frac{1}{4}$ c cm may be given at first, 1 c cm an hour later, and the remainder of the dose necessary from three to four hours later.

Intravenous injections should be avoided, even in patients with no indication of sensitivity to serum, except when the indications for this method of administration are very definite, in such cases the serum should be diluted, 1 part to 9 parts of saline solution.

When only a small dose of serum is given, as for prophylaxis, a highly purified serum should be employed. For therapeutic purposes, when repeated doses are to be given, a serum with a high antitoxin titer or rich in immunizing substances should be employed in as small doses as possible.

Serum therapy should be sufficiently intensive at the beginning of the treatment to avoid prolongation of the treatment, and especially to avoid its repetition after the patient has been sensitized. If it is necessary to interrupt the treatment and then renew it more than ten or twelve days later, the patient should be regarded as sensitized and should be treated as such.

When a patient is known to be sensitized by a previous serum therapy, or when the history indicates the probability of such sensitization, when there is a hypersensitivity to horse allergen, or when the reaction to the intradermal or ophthalmic test with dilute horse serum is positive, the following procedures should be carried out:

An intramuscular injection of from $\frac{1}{2}$ to 1 c cm of adrenalin (1 : 1000 solution) should be given a half hour before the first injection of serum. An hour before the first injection of serum an intramuscular injection of 10 c cm of magnesium thiosulfate or of calcium gluconate or 5 c cm of polycamphosphonate (Lysochoc) should be given. Since the latter preparation contains adrenalin not more than $\frac{1}{2}$ c cm of adrenalin solution should be used subsequently if this preparation is given. *If serum therapy is absolutely necessary in a case in which sensitization is definite and marked the magnesium thiosulfate or calcium gluconate should be given intravenously followed by 1 c cm of adrenalin the latter should be given one half hour before the first injection of serum.*

The serum should be given in fractional doses as recommended by Besredka i.e. subcutaneous injections of from $\frac{1}{10}$ to $\frac{1}{4}$ c cm $\frac{1}{2}$ c cm 1 c cm or 2 c cm should be given at half hour interval then the remainder of the dose.

Intravenous intraperitoneal or intraspinal injections of serum should be avoided in patients with definite indications of sensitization. If an intraspinal injection is absolutely necessary fractional doses should be given subcutaneously as indicated then 1 c cm should be given intraspinally and the entire dose from two to three hours later.

Only purified serum should be used and if there is any reaction after the first dose of serum no further serum should be given except in cases of absolute necessity. In such a case the same procedure should be used for the second dose as for the first injection. If there is no reaction it is well to give ephedrine by mouth an hour before each subsequent injection and to carry out Besredka's method of fractional doses on each occasion.

In any case serum injections should be given slowly and stopped if any signs of a reaction occur. If a severe reaction occurs during or immediately after an injection of serum 1 c cm of adrenalin solution should be given intramuscularly. Magnesium thiosulfate or calcium gluconate may also be given intravenously or intramuscularly in doses of from 10 to 20 c cm.

When one or several serum injections have been given it is advisable to give ephedrine by mouth every eight hours in the dosage indicated. Magnesium thiosulfate calcium gluconate or polycamphosphonate may also be given by mouth if the latter is used the ephedrine should be reduced.

If any symptoms of serum disease develop the amount of ephedrine should be increased by the administration of the same individual dose every four hours. Gardinal and acetylsalicylic acid may be given also. Magnesium thiosulfate calcium gluconate or polycamphosphonate may be given intramuscularly one of the preparations that has not been used prophylactically should be used. Symptomatic treatment should also be employed as indicated.

AUCE M MEYERS

ANESTHESIA

Co Tui The Present Scientific Status of Spinal Anesthesia *Anes & Anal* 1933 17 146

The author believes in spite of the 2500 contributions on the subject of spinal anesthesia that only an empirical knowledge has been disseminated. He believes that much of the discussion of spinal anesthesia has come from surgeons and that future reports concerning spinal anesthesia must come from the experimentalist or from the anesthetist. In the determination of the dosage of procaine there is a closer relationship between the length of the spine and the intradural volume than between the weight of the body and the intradural volume and for this reason Co Tui does not believe that the method of determining the dosage by the patient's weight is a valid one.

In determining the hydrodynamic of spinal anesthesia the author made use of horizontal tubes which could be observed in various positions and injected radio opaque media into the subarachnoid space of experimental animals. He does not believe that the diffusion factor is of very great importance in comparison with the gravitational current induced by the different weight between the spinal fluid and the injected substance. Uroelectan injected into the subarachnoid space of an animal changes its position according to the position of the spine. Another factor of importance is that of friction. This factor is active in children or in patients who have a spinal canal of small caliber. The phenomenon of drainage to dependent parts by the heavier fluid is also of some importance in explaining certain failures in analgesia of a segmental type.

In conclusion the author states that further investigations on the human subject are required especially of the interrelationship of anatomical and peculiarities which are so prominent.

WILLIAM C BECK M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Calchi-Novati, G., and Vaghi, A. Roentgen-Kymographic Observations in Some Cases of Cardiac Affections (Osservazioni roentgenchimografiche in alcuni casi di affezioni cardiache) *Radiol med*, 1938, 25 119

Using the adjustable slit kymograph described by Cignolini, the authors present the kymographic findings in cases of mitral and aortic insufficiency, myocardial disease, progressive endocarditis, and Basedow's disease. Great superiority is claimed for the Cignolini type of grid over that perfected by Stumpf and his associates.

SYDNEY E. JOHNSON, M.D.

Meyer, A. Kymography as an Aid in the Differential Diagnosis of Mediastinal Tumors *Brit J Radiol*, 1938, 11 436

The author, after a relatively short experience in the use of kymography, has come to the conclusion that this method is, for the present at least, of rather circumscribed value. At St Bartholomew's Hospital it has been found of specific value only in the differential diagnosis of mediastinal neoplasm and aneurysm of the aorta. In this field, the author had previously depended upon fluoroscopy and ordinary roentgenograms but these methods had often failed to permit accurate diagnosis.

In kymograms, that portion of the aneurysm which pulsates will give a characteristic outline (called an aortic type of tracing), which has a horizontal upper, and a sloping lower, margin. Kymographic studies demonstrate that neoplasms move by virtue of their close proximity to the aorta, or of their own vascularity. They are never homogeneously pulsatile, and they do not produce the characteristic aortic outline. Their outline in the kymogram is either rounded or angular and, if angular, both the upper and lower margins are sloping. The outline of an aneurysm tends to merge with the outline of the aortic area, but the moving wall of the aorta can generally be seen through the shadow cast by a new growth. A further refinement of technique is the use of oblique grids in the kymograph. The author does not describe the findings when such grids are used.

A number of excellent illustrations are included in this article.

HAROLD C. OCHSNER, M.D.

Stewart, D. M. Roentgenological Manifestations in Bone Syphilis *Am J Roentgenol*, 1938, 40 215

Bone and joint changes in congenital syphilis are described briefly under the following classifications: (1) epiphysitis, (2) periostitis, (3) epiphyseal separation, (4) circumscribed rarefying osteitis of the long and flat bones, (5) dactylitis (rare), (6) true



Fig. 1. Osteomyelitis of the congenital syphilitic type. Note the typical periosteal proliferation about the ulna in both upper extremities, plus the typical appearance at the epiphyseal ends of the bones. This periostitis is of the second type in the classification by McLean.

bowing of the tibia in its lower two-thirds, (7) pathological fractures (rare), (8) osteomyelitis, (9) osteochondritis, and (10) Parrot's nodes on the flat bones. In his summary, the author states that these changes are more common than is generally believed, and that they are characteristic of congenital syphilis. Their recognition roentgenologically may help to establish the diagnosis when other signs are equivocal or lacking.

In acquired syphilis, the changes discussed are (1) periostitis, (2) osteitis, (3) arthritis, (4) synovitis, (5) osteochondritis, and (6) gumma. The various roentgenological manifestations are considered to be of great value diagnostically, even in the presence of negative serological findings.

The treatment of syphilis of the bones and joints is considered briefly. It is stated that oral medication plus inunctions if continued over long periods of time will produce a disappearance of the osseous and articular luetic lesions.

ADOLPH HARTUNG, M.D.

Mandeville F B Roentgen Findings in Morvan's Type of Syringomyelia *Am J Roentgenol* 1938 40 230

A brief historical review and clinical description of syringomyelia precedes the author's presentation of a case report illustrating the roentgen findings in this condition. It is stated that bone changes in syringomyelia are probably more common than is generally recognized. They are practically identical with those of Charcot's joints and Charcot included them in his original description of arthropathies.

Numerous authors point out that the tabetic condition occurs more frequently in the lower weight bearing joints while the joints affected in syringomyelia are more common in the upper extremities. Conditions other than syphilis and syringomyelia may produce bone changes of a similar nature and the author gives consideration to some of the theories presented to explain those changes.

The author's case which is reported in detail presents classical symptoms and findings of Mor-

van's type of syringomyelia although this was not recognized until after several years of observation. The roentgen findings include atrophy of the terminal phalanges of the fingers, trophic changes in the joints of the upper extremities, scoliosis and thoracic deformities in the nature of pathological fractures.

ADOLPH HARTUNG M D

Butler F E and Woolley I M The Roentgen Treatment of Chronic Sinusitis *Radiology* 1938 30 686

During the past seven years the authors have observed the effects of the roentgen ray as a therapeutic agent in chronic sinus disease. During this time they have studied the results of roentgen rays on experimental animals and have observed the clinical treatment in the cases of well over 2000 patients. With this experience as a basis they believe that they are justified in recommending more general use of roentgen therapy for cases which are found to be adapted to it.

Rationally judging from the effects of roentgen therapy in other fields it ought to be effective in this condition. It has been found experimentally that the early influx and destruction of lymphocytes and the liberation of the antitoxic substances which they are thought to contain together with the early appearance of macrophages in greater numbers intensify the usual reaction to the infection and hasten repair.

Roentgen therapy is not applicable to all types of sinusitis. The treatment of atrophic forms of sinusitis and of cysts or polyps has not met with success. Similarly patients who failed to gain relief following radical surgery usually responded poorly to irradiation. When considerable fibrosis was present the results have been variable.

According to the authors' experience the most favorable results were obtainable in those patients who had had symptoms of chronic infection extending over a period of months or years and whose roentgenograms showed a markedly thickened membrane with a small air-containing cavity in the center. These patients usually responded to a single treatment. The favorable effects noted were not limited to the local condition but included improvement of the secondary symptoms which were commonly present. Reactions produced by the irradiation were negligible. In no instance was there a harmful result.

The technique of treatment used is described in detail. Essentially it consisted in the localized administration of 700 roentgens with back scattering to the involved sinuses. The factors are 120 kv p, 5 ma, 4 mm of aluminum filter, 11 in distance with irradiation for ten minutes through each port. Most of the patients in whom good results were obtained required only one treatment. Recently a 200 kv p technique with a dosage of 450 roentgens measured in air has been used with equally good results.

ADOLPH HARTUNG M D



Fig 1 Left hand showing atrophy of most of terminal phalanges with flexion of distal interphalangeal joints giving the typical claw hand of Morvan's type of syringomyelia.

Von Schubert, E. Six and a Half Years' Experience in Carcinoma Therapy with Extra Hard Roentgen Rays (Fourth Report) *Radiology*, 1938, 31: 142

The University Clinic of Gynecology, the Charité, in Berlin was the first institution on the Continent to use x-ray radiations generated at a substantially higher tension than had been customary, and an apparatus producing such radiation has been in use in this institution since December, 1930. A Sanitas apparatus, capable of producing 600,000 volts in continuous operation, has been used with Osram tubes. This apparatus will work at such tensions for any desired length of time.

The author believes that statistical studies relating to the treatment of carcinoma of the cervix are so well known that the results of his method of treatment are the best basis for analysis and comparison. Of 105 patients with carcinoma of the cervix in all stages, 22, or 20.9 per cent, are alive and well after two or more years. Ninety-two of these were in Stages 3 and 4. None of the patients in Stage 4 have been cured. Of 73 patients in Stage 3, 14, or 19.2 per cent, survived for a period of two or more years. The favorable results obtained in the cases of patients in Stages 1 and 2 of the disease are based on such few numbers that no definite conclusions may be drawn. The reason that so few patients in these groups are treated is that extremely radical operations are customary in this clinic, only the most severe conditions are treated by means of roentgen therapy.

The capacity of the x-ray tubes used was only 1.5 ma. The focal skin distance was 94 cm, and a filtration of 3 mm of copper and 3 mm of aluminum was used, with an output of from 3 to 4 roentgens per minute. Irradiation was given in small daily doses, or in massive doses every two or three days, the latter method requiring sessions of many hours. The author prefers the massive-dose method. The depth dose, with the apparatus and the technique used, was approximately two-thirds of the incident dose. Relatively low doses of 2,000 roentgens or, at the most, 3,000 roentgens administered in a short period of time were felt to be most effective. The results obtained by increasing the dose to 5,000 or 6,000 roentgens were disappointing. In the healing of carcinoma, the surrounding tissues perform an important function and must not be unnecessarily injured. The author believes, as Wintz, that the smallest dose necessary for the destruction of carcinoma is also the best for a complete cure.

A review of 194 cases of carcinoma reported by the author, the treatment of which dates back over a period of two or three years, reveals that advanced carcinoma cannot at this time be cured with super-voltage therapy. The results of treatment of carcinoma of the cervix in Stages 1, 2, and 3 are worthy of attention. Good results have also been obtained in cases of vaginal carcinoma. Only occasionally was a good result obtained in other regions by such treatment, but this was on account of the desperate condition of the patients when they first sought treatment.

HAROLD C. OCHSNER, M.D.



MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Greene M B and Kaufman J Pain Its Surgical Relief and the Role of X Ray Localization
Theclin Radiology 1938 30 691

Although certain forms of pain may serve as a useful defensive function others may be an excessive reaction parapsychological useless and damaging provoked by destructive stimuli to which the organism cannot produce adequate protective response. The latter types of pain may require neurosurgical methods for relief. Failure to accomplish such relief by these methods has often been due to lack of proper localization both from diagnostic and therapeutic points of view and this paper is devoted largely to means whereby accurate localization may be achieved and utilized to improve the results.

To relieve the pain syndrome surgically it is necessary to interrupt the conductivity in a sufficient number of the peripheral or visceral nerve fibers supplying the given area to reduce the excitability sufficiently to arrest the passage of an excessive number of impulses. Some of the disadvantages of doing this by means of resection are discussed. Nerve blocking is definitely preferable in certain cases. The chief difficulties of nerve blocking procedures are discussed at some length.

Paravertebral or prevertebral nerve block when performed by fractional technique is a selective method of precision. To perform such a nerve block a minimal amount of solution should be employed. In order to accomplish this it is necessary for the neurosurgeon to be familiar not only with the relations that the respective nerve trunks bear to the deep bony landmarks which he is to utilize during the nerve blocking technique but he must also know the exact location and depth of such bony landmarks as well as be able to localize such bony landmarks in their relation to the surface of the skin. In instances in which it is desirable to resort to such procedures as precision laminectomy or chordotomy exact knowledge of the location of the respective bony structures which serve as landmarks and beacons to the neurological surgeon is indispensable. Other neurosurgical procedures similarly require precise visualization.

To accomplish such exact localization the authors developed a mathematically precise graphic method of x ray localization. This method is described in detail under the following headings: (1) anatomical structures designated by the anesthetist surgeon (2) application of the skin points (3) preparation of the x ray films (4) preparation of the x ray table (5) x ray procedure (6) analysis and marking of the x ray films (7) transcription of the x ray data (8) analysis of the transcribed data (9) vertical projection chart (10) depth chart (11) application

of the localization chart and (12) derivation of the Standard Depth Curves.

Among the various conditions amenable to neurosurgical procedures for relief of the pain syndrome the following are discussed briefly: precordial pain, causalgia and reflex contractures, neuritis and neuralgia developed as sequelae of certain injuries, essential hypertension, narcotic drug addiction from treatment, circulatory disturbances in diabetes and orthopedic conditions.

ADOLPH HARTUNG M.D.

Troland C E and Lee F C Thrombocytopenia
A Substance in the Extract from the Spleen of Patients with Idiopathic Thrombocytopenic Purpura That Reduces the Number of Blood Platelets *J Am Med Ass* 1938 111 22

The authors attempt to describe an extract obtained from the spleen of patients suffering from idiopathic thrombocytopenic purpura which reduces the number of platelets in the circulating blood.

Extracts with reagent acetone were made from three spleens surgically removed from patients suffering from this disease. In the first two cases the extraction was permitted over a period of sixty-seven and one hundred and two days while in the third case extraction was made over a period of only six days. These three extracts were injected into the veins of rabbits, cats and dogs and uniformly a definite fall in the platelet count was observed. The reduction was extremely marked in a few hours but returned to normal rapidly within one or two days. However the reduced platelet count could be maintained by repeated injections of the extract. As soon as the extract was no longer injected the platelet count returned to its pre-injection level. The extract was found to be more or less thermostable. With the injection of the extract there was a definite increase in the bleeding time. The injection of a similarly prepared extract of the thyroid and the myomatous uterus produced no similar reaction neither did such a reaction occur following the injection of a similarly prepared extract derived from the spleen of a patient with Banti's disease.

The authors concluded that in idiopathic thrombocytopenic purpura a definite toxin or thrombocytopen is produced by the spleen. They have devised a method for producing the disease experimentally.

WILLIAM C BECK M.D.

Leriche R and Jung A The Pathological Importance of Calciuria (Importance pathologique de la calciurie) *Rev dech Path* 1938 57 346

From their study of the calcium in the urine of normal persons and in persons with various pathological conditions Leriche and Jung conclude that the excretion of calcium in the urine depends not upon the ingestion of calcium in the food but upon the endogenous calcium i.e. upon the calcium

reserve in the bones. The calcium in the urine averages 0.150 gm per liter, from 0.100 gm to 0.200 gm per liter for twenty-four hours is to be considered as normal.

In tetany hypocalcemia is the rule, in most cases, the calcium excreted in the urine is less than 0.045 gm per liter for twenty-four hours. However, in some cases of tetany the calcium excretion in the urine may not be reduced, it is constantly low in tetany because of parathyroid deficiency. Tetany appears to the authors to be a syndrome due to deficient utilization of the calcium present in the blood and in the reserves of the body. The authors have found that the transplantation of os purum relieved the symptoms of tetany although it had no effect on either the blood calcium or the urinary calcium. In spontaneous tetany, median cervical sympathectomy or sinu-carotid neurectomy, operations which activate the parathyroids, resulted in cure.

In determinations of the urinary calcium in various other types of disease, the authors noted that in fractures there was a phase of excess urinary excretion of calcium in the later stages of healing. In pathological fractures, the excess excretion of calcium was more marked. In localized fibrocystic osteitis, the calcemia was usually normal, in 3 of 5 cases of generalized fibrocystic osteitis, there was a definite hypercalcemia. The urinary excretion of calcium was found to be variable in osteomalacia, in various types of chronic arthritis, and in scleroderma. It was normal in 4 cases of Paget's disease, 3 cases of scoliosis, and 1 case of Schlatter's disease. In 2 cases of primary bone cancer the urinary calcium was normal, but in a case of multiple secondary bone metastasis, there was definite hypercalcemia. In 4 cases of post-traumatic osteoporosis, in which lesions were localized or diffuse, but which were cured by local infiltration or arterial sympathectomy, the urinary calcium was normal. However, in cases of post-traumatic osteoporosis with a tendency of the lesions to extend, in which the methods of treatment noted were not effective, the urinary calcium was increased above normal. In Basedow's disease, 3 of 6 cases showed an increase in the urinary excretion of calcium, there was no direct relation to the increase in the basal metabolism. In 3 of 5 cases of pituitary dysfunction, there was a hypercalcemia, in 2 cases of Dercum's disease the urinary calcium was normal.

The relation of increased urinary excretion of calcium to urinary lithiasis is of importance. Recently the relation of hyperparathyroidism to renal lithiasis has been recognized. In 2 cases of renal lithiasis, the authors found not only an increased urinary excretion of calcium from the endogenous reserve, which indicated an increased loss of calcium, but also an increase in the blood calcium, an indication of hyperparathyroidism. In addition, the authors have observed a case of renal lithiasis associated with an increased urinary excretion of calcium in fracture, a case of Basedow's disease, and a case

of polyarthritis with ankylosis. In these cases osteolysis plays an essential rôle in producing the increase in the urinary excretion of calcium. The authors also observed a case of renal lithiasis associated with hyperpituitarism. ALICE M. MEYERS

Hamilton, J. F.: Pseudomycosis Indolent Leg Ulcer. A Study of 54 Patients. *South M J*, 1938, 31: 579

The author has dealt with 54 cases of pseudomycosis or indolent leg ulcer caused by the micrococcus mycetis, an organism first described by Castellani. The ulcers have an extraordinary mycotic appearance which in the slowly spreading type shows round, punched-out, fairly deep lesions with slightly rolled edges and a necrotic myxomatous base. The rapidly spreading type has thin, irregular, undermined edges and a myxomatous or pale granulation base. The ulcers vary in size from a few millimeters to 10 centimeters in diameter. The lesion is limited entirely to the skin and subcutaneous tissues unless the surgeon's scalpel has opened the way to the deeper structures.

The history of onset is usually insidious and the patients frequently relate a mosquito bite, spider bite, or briar scratch as the cause of the ulcer. A stinging or burning sensation and pruritis develop, followed by swelling, redness, and, less frequently, fever. From twenty-four to forty-eight hours later, if the infection begins in the superficial layers of the skin, a small pustule forms in the center of the inflammatory area. Usually this pustule has been opened by the patient or the family physician, and an ulcer is left which fails to heal properly and grows larger in spite of treatment. If the infection begins in the deeper structures or becomes disseminated from the original focus, the signs of inflammation will be more pronounced, probably appearing as a hard brawny cellulitis. Constitutional symptoms of a greater or lesser degree usually are associated with the cellulitis, surgical incision on such areas only makes bad matters worse. The leucocytic response is mild except in the active, undermining stage of the disease. In the presence of cellulitis with abscess formation a white count of 18,500 leucocytes with 82 per cent polymorphonuclear-neutrophils has been encountered. The Wassermann and Kahn reactions have been uniformly negative.

The organism is a coccus which varies in its staining characteristics, being sometimes gram-negative and sometimes gram-positive. When obtained from an ulcer it is generally mixed with other invaders. It can usually be made to grow in ordinary media if it has first been subcultured on special media. When so grown it will generally prove to be a gram-positive coccus growing in chains. On blood agar plates it is hemolytic, showing larger areas of hemolysis when cultured anaerobically at room temperature than the ordinary streptococcus hemolyticus.

In many patients it produces a quick and rapid destruction of the integument and subcutaneous tissues. Frank pus forms at an early stage, but when

the drainage becomes established the discharge becomes serous and seropurulent. Blind sinuses and undermining of the skin may be considered characteristic findings in this disease. A honeycombing of the subcutaneous tissue by infection results in multiple small ulcers which form several centimeters away from the parent ulcer. These daughter ulcers rapidly enlarge with the melting away of the skin in the wake of the infection. The margins of these secondarily formed ulcers likewise become undermined. They show a slight tendency to heal. Some infections have occurred where the healthy leg rubbed against the infected area.

Many different chemicals and modalities have been used in the treatment of this condition and we are still in search of an agent that will be more effective. The following is an outline of the treatment we have found most effective:

1. Absolute bed rest if possible

2. If the ulcer is dirty with adherent crusts these are removed and fresh urea solution is applied for from one to two hours three times a day with dry heat between dressings.

3. If the ulcer is clean potassium permanganate in 1:500 dilution is applied as a wet dressing for the first forty eight to seventy two hours then alternately with other agents. During the day a fresh solution of 0.5 per cent cysteine hydrochloride is applied to the ulcer for one hour and alternated with dry heat for three hours.

Surgery is employed as little as possible particularly in the burrowing undermining type of lesion for very serious flare ups have followed ordinarily trivial surgical procedures. Skin grafting can be contemplated only after a number of bacterial counts have demonstrated freedom from gram negative or gram positive intracellular diplococci. There have been but two recurrences and no deaths in this series but the morbidity is appallingly high. The shortest duration of the disease was four weeks the longest ten years and the average thirteen and one half months. A little less than half of the patients were hospitalized the remainder were treated at home. The shortest period of treatment was two weeks the longest fourteen and one half months and the average two and seven tenths months.

JOHN WILTSIE ERTON, M.D.

Webster J. H. D. Periodicity in Cancer and Other Neoplastic Diseases (450 Cases). *Brit J Surg* 1938 26 113.

Cancer cured by operation or radiotherapy soon after the first onset of signs shows no indication of being a periodical disease. However analysis of its recurrent phases has shown cancer to be one of a group of neoplastic diseases having a thirty three weeks periodicity. This new conception opens up possibilities of considerable advance in the practical control of cancer and in comprehension of its essential nature.

The knowledge of periodicity has already made possible the correct prediction of the probable num-

ber of weeks before recurrence and these fresh signs of disease which formerly were considered unpredictable are now known to fit into a regular pattern or system of a thirty three weeks cycle (eight lunar months) or half periods (four lunar months) with the active peaks occurring either singly or in multiples as missed periods.

Of all patients with recurrences 96 per cent have shown this periodicity clearly with the exception of patients with very chronic tumors or with tumors in inaccessible sites or of those who had not been followed up closely. The eight lunar months pattern has been chosen as the standard because in cases of carcinoma and leucemia over twice as many single full periods as half periods have been seen or calculated and this predominance of full periods has been as evident when multiples have been added. In sarcoma and Hodgkin's disease the half periods have nearly equaled the full periods.

Periodicity was traced in detail in 450 neoplastic patients. The series included carcinoma, sarcoma, recurrent papillomas, leucemia and lymphadenoma, possibly also Mikulicz's disease and other benign neoplasms. Neither surgical treatment nor irradiation appeared to have an influence on periodicity. This was shown by patients for whom a peak of rapid growth had been determined before the treatment began, recurrences followed at periods or half periods irrespective of the treatment. The alternatives appeared to be cure or periodicity. Fallacies in the determination of periods were due mainly to delayed observation of the clinical onset or early periods of primary neoplastic disease or of the earliest recurrent signs. The time lag between the microscopical origin and the clinical appearance as well as the growth rate must vary greatly in different tumors but the growth rate of recurrence of the same tumor in the same patient rarely varied a great deal except for the acceleration often seen in the terminal stage. For a high degree of statistical accuracy a series of patients with a tendency toward recurrence should be examined at weekly intervals before and during probable recurrent maxima. The most conclusive proof of periodicity would appear to be success in the prediction of recurrences and already several successful predictions have been made.

Neoplastic periodicity seems to bring forward circumstantial evidence in favor of the virus theory of cancer. A virus origin which has been proved for some skin papillomas, fowl leucemia and fowl sarcoma is very probable for human leucemia and lymphadenoma. No other cause for the periodicity but a virus presents itself.

Analysis of the dates of recurrence has shown that in breast cancer, sarcoma, leucemia and Hodgkin's disease almost one and one half as many recurrences have taken place in the first four months of the year as in each of the two other four month periods. This finding confirms the observations of Peacock and of Fraenkel on seasonal periodicity in animal tumors. Growth and transmissibility are more vigorous in the egg laying months.

The half periods may indicate a double infection, such as a double tertian malarial infection. Half periods have been seen most commonly in sarcoma and Hodgkin's disease.

Important practical applications of neoplastic periodicity are suggested in the fields of prevention, diagnosis, prognosis, and treatment. Prevention of recurrences may result from prophylactic irradiations or other treatment given before the expected peak of growth activity. This has already been tried with x-rays in several patients. The prevention of primary neoplastic disease should be increased (if these observations are confirmed and it is agreed that they support the virus theory) by further researches on virus pathology and the predisposing factors to infection, and on susceptibility and immunity to tumors. The diagnosis of recurrences which are doubtful is rendered more probable if the new signs in the patient occur at a maximal period or half period. The weeks and months of possible recurrence may be told in advance with reasonable accuracy once the patient's periodicity has been determined, in primary cases by any sudden increase in the tumor size, and in recurrent cases by the earliest signs of new local or distant metastases. Also the probable month of death of patients in the terminal stages of metastasis may be foretold with some approach to accuracy in cases not complicated by other diseases, e.g., renal or cardiac disease. For treatment at the earliest possible time, the patients should be observed especially shortly before, during, and for some time after the periodic maxima (full and half periods), and the follow-up should continue for many years. The many instances of missed or latent periods which are seen suggest the presence of a quiescent virus, which germinates when its own inherent cycle of activity happens to coincide with the host's lowered resistance or hormonal stimulus. Re-infection cannot be excluded, but would be unlikely at a period.

JOSEPH K. NARAT, M.D.

Willis, R. A. A Metastatic Deposit of Bronchial Carcinoma in a Hydrocele Misdiagnosed "Endothelioma." *J. Path. & Bacteriol.*, 1938, 47, 35.

Willis has made a special study of the so-called endotheliomas of serous membranes. He has noted that authors, in reporting such cases, have consistently failed to exclude the possibility that the tumor was a metastatic implantation on a serous structure of an epithelial tumor primary in some other area. He states that there are no distinctive histological criteria of endothelioma which are not also present in some carcinomas, and that the diagnosis of "endothelioma" is quite unjustified unless primary carcinoma has been excluded by complete post-mortem examination.

The case of a man seventy-four years of age is reported. The author himself made an original diagnosis of primary endothelioma of the tunica vaginalis developing in a hydrocele. At autopsy, however, a small bronchial carcinoma was discovered, which was histologically identical with the scrotal tumor.

The pathological findings are reported in detail, and the article is accompanied by photographs and photomicrographs of the primary and metastatic tumors.

JOHN LOCKWOOD, M.D.

DUCTLESS GLANDS

Schaefer, R. L., Sharp, E. A., and Lammy, J. V. Clinical Indications for Anterior Pituitary-Like Sex Hormone. *Endocrinology*, 1938, 22, 643.

The extract Antuitrin-S used in this experiment was obtained from human urine of pregnancy. One rat unit is the minimum quantity of urine extract which will cause the formation of one or more corpora lutea, and is usually regarded as containing follicle-ripening and luteinization factors. The gonad-maturing action demonstrated in immature female rats offers a presumptive indication for its clinical use. If the action of the hormone, as outlined, constitutes a true premise, it is proper to conclude that an immature state of the gonads is a manifest indication for the therapeutic use of this remedial agent.

The 44 cases cited in this report were treated consecutively. Their complete diagnostic survey is presented in detailed comparative charts.

One of the most common syndromes is Froehlich's syndrome. Cryptorchidism may or may not be associated with this syndrome. In this group of cases there were 5 Froehlich syndromes, and in 4 of these cases cryptorchidism was present. Four of these responded to treatment with complete testicular descent. In addition, the aplastic genitalia of the adiposogenital pituitarisms were definitely converted into organs of normal size. It would seem from these studies that surgery is indicated only after the failure of descent following adequate treatment with Antuitrin-S, or in the presence of demonstrable anatomical barriers to descent.

The theoretical objection to the administration of a hormone capable of producing sex precocity is not real in relation to early epiphyseal closure if it is employed judiciously for from three to six-week periods in the dosage indicated.

Of the 15 cases of amenorrhea studied, 4 showed adiposogenital pituitarism. Because of the amenorrhea in these cases, it was supposed that they should be regarded as presenting gonadal immaturity.

Of the 13 cases of menometrorrhagia studied, specific response to Antuitrin-S was shown in 6. Because of the beneficial effect in this younger group of patients, it was supposed that they should be regarded as having mature gonads.

In the menopause, the use of Antuitrin-S resulted in an aggravation of the symptoms whereas the use of the follicular ovarian hormone was of value.

Sixteen cases of genital hypoplasia and cryptorchidism, 15 cases of amenorrhea, and 13 cases of menometrorrhagia were treated. The results were uniformly good in those cases in which competent diagnostic procedures were used to indicate treatment, with some exceptions described in the article.

It is of utmost importance to correct pre adolescent endocrine imbalances. Secondary thyroid deficiency can rarely be disregarded. Definite dosage cannot be defined but must be individualized. Treatment should be prolonged and continuous before the conclusion is drawn that the existing imbalance cannot be corrected. In the opinion of the authors anterior pituitary like sex hormone is the maturing factor of the gonads.

JOHN E. KIRKPATRICK, M.D.

EXPERIMENTAL SURGERY

Martos J. Bone Changes in Experimental Hyperthyroidism and in Basedow's Disease (Knochenveränderungen bei experimentellem Hyperthyreoidismus und bei Basedow's Krankheit). *Beitr. path. Anat.* 1938 100 293.

Although the presence of bone changes in diseases of the thyroid gland has been well known for a long time, thorough systematic investigation has been lacking until recent times when work was conducted by Hunter, Rutishauser and Askanazy. All investigators have found the same type of progressive absorption of bone. It was Hunter who explained the etiological relationship between thyroid gland disease and bone changes and differentiated the bone changes which were caused by parathyroid disease.

Because our information has been inadequate in spite of all previous investigations, the author has attempted to enlarge the scope of our knowledge. During the course of a series of experiments, rabbits, guinea pigs, and cats were fed either raw thyroid or thyroid preparations (thyroxin Richter and thyleran Bayer). The animals were kept alive for a year and at autopsy the bones were examined histologically.

In addition, a histological survey of the bones of twelve patients dying from Basedow's disease was undertaken. The bones of the experimental animals revealed atrophy, unquestionably the result of an osteoclastic process. The author observed an irregular enlargement of the bony canals in which the marrow was inverted, either myelotic or fibrous. The changes were most pronounced in those parts of the bone which are subject to greatest physical stress; slight changes were detected throughout all the bones. The microscopic picture was similar for both groups of animals, whether fed raw thyroid or thyroid preparation, but surprisingly less involvement occurred when thyleran was employed.

The bone changes revealed in patients with Basedow's disease were in general similar to those found in animals, although there were certain differences. These consisted in bone changes which were more pronounced in the human than in animals. They indicated that the bone had been exposed to damage for a longer period of time. In individual cases the bone was so severely affected that the changes could be observed macroscopically. The microscopic picture resembled that of generalized osteodystrophia fibrosa. Irregular plump bony septa were seen in which the marrow was filled with fibrous tissue. The bone changes were not characteristic of thyrotoxicosis; they are frequently found in other types of poisoning, particularly those due to heavy metal and their salts. The etiology of these bone changes still remains uncertain; they are probably due to thyroxin or one of the other poisons, but they are certainly not caused mechanically through changes in the dynamics of the blood vessels, as some investigators assume. (G. BEYER) NOAH D. FABRICANT, M.D.

INTERNATIONAL ABSTRACT OF SURGERY

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PRINCIPLES OF SURGICAL PRACTICE

RECENT TRENDS IN THE TREATMENT OF INGUINAL HERNIA

LEO M. ZIMMERMAN, M.D., F.A.C.S., Chicago, Illinois

THE literature on inguinal hernia has followed a curiously repetitious pattern since the revolutionary publications of Bassini a half-century ago. Little of fundamental importance has been added during this period. On closer study, however, positive progress may be seen in the recent more analytical approach to the old problem. Writings of the last few years reveal a definitely more critical attitude, both toward the teachings of the masters and the contributions of their successors. Newer methods of treatment must now be based upon rational anatomical and physiological foundations, if they are to find acceptance. Results of therapy must more and more be supported by actual follow-up data over adequately long periods, and nothing less than personal re-examination of the patients serves as a measure of the value of therapeutic methods. These requirements have necessitated a downward revision of the percentages of cures obtained by the various procedures, and, in so doing, have constituted a challenge that new and better methods be devised. In the search for a more effective attack, there has been an encouraging tendency to approach the problem with an analysis of the actual lesion to be repaired, and an attempt to find a remedy to correct it, rather than to slavishly employ the operation of this or that authority. This has entailed a clearer differentiation between direct and indirect types of inguinal hernia, and has necessitated a wider repertory of surgical methods to match the different problems encountered. With this approach, improvement

in the results of hernial surgery would seem to be inevitable. The two particular phases of the subject that have received the greatest attention in the recent literature have been the ambulant treatment of inguinal hernia by the injection method, and the use of autogenous fascial strips for suture material in hernial surgery.

INJECTION TREATMENT OF INGUINAL HERNIA

No aspect of the hernia question has received as much attention in the recent literature as the injection treatment. Despite this voluminous discussion, it is still difficult to evaluate the merits of the method. It is to be regretted that so many prematurely enthusiastic reports have appeared, based upon scant material and unsupported by control or follow-up, that exaggerated claims from the manufacturers of sclerosing solutions, widespread newspaper publicity, and the pressure of lay industrial and insurance organizations have led to the early adoption of the method by large numbers of practicing physicians before its achievements as well as its limitations and dangers could be adequately established. On the other hand, sufficient experience has been gathered by reliable authorities to merit respectful consideration for the ambulant treatment of hernia.

The injection treatment of hernia is not new. Originally introduced about a hundred years ago, it was soon abandoned by reputable physicians and relegated entirely to charlatans and quacks. The inevitable accidents and failures at the hands of untrained and often unscrupulous practitioners served to bring the method more and more into disrepute. It was kept alive, however, by a few

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men notably Pina Mestre in Barcelona and Ignatz Mayer in this country. The resurgence of interest in the ambulant management of hernia is largely due to the efforts of Bratrud and Rice and their colleagues at the University of Minnesota Medical School. In the past six or seven years the widespread interest of numerous investigators has increased our knowledge of the method.

The ambulant treatment of hernia is based upon the injection of irritating solutions into and about the inguinal canal with the object of inducing sufficient proliferation of fibrous tissue to permanently close the defect in the abdominal wall through which the hernia protrudes. The advantages of such a method are obvious. Aside from the natural abhorrence for surgery, the avoidance of the risks, discomforts and expenses of operation and the elimination of hospitalization and prolonged interruption of earning power are telling arguments to the patient, the physician and the insurance carrier. If as is often claimed the results are as good as or even better than those of surgery, and if the method can be applied to patients who are unfit for or refuse operation, then the rapid acceptance of this method is deserved. On the other hand, there are certain disadvantages such as the compulsion of wearing a truss day and night for a prolonged period, the necessity for multiple injections, the inevitable risks and complications associated with a blind method and uncertainty as yet as to the incidence and duration of ultimate cures.

There are numerous reports in the recent literature of experimental work relating to the injection method. These studies have been made in an attempt to demonstrate that artificial proliferation of fibrous tissue can be secured by the injection of sclerosing solutions to evaluate the relative merits of the various solutions employed to determine the accuracy with which the fluid can be delivered to the desired sites and to observe the effects of injection into the blood stream, peritoneal cavity and spermatic cord. It has repeatedly been shown (Bratrud, Rice, McMillan, Crohn, Harris and White and others) that the injection of the various sclerosing agents into the tissues of man or laboratory animals results in aseptic inflammation with the proliferation of fixed tissue cells and the production of fibrous tissue. The permanence of this newly proliferated tissue and its efficacy in curing hernia, however, are still in question. Crohn states: "The research has successfully demonstrated that the injection of irritating fluid produces scar tissue, but no work has been done to prove that such scar tissue per se cures a hernia." He points out that surgeons

meticulously avoid scar tissue formation in closing abdominal incisions in order to prevent hernia. The phenomenon of recurrence following operation for hernia in which the sac is often buried in dense scar tissue would tend to support this question. Burdick and Coley, reporting failure of the injection method in their hands, describe their findings in several cases that came to operation at various intervals following injection. They state: "In no case did we find the clinical or microscopic evidence of a strong bulwark of built up scar tissue which is claimed by many workers to result from the injection treatment. In one or two cases some strands of connective tissue partially occluded the opening of the neck of the sac. There was some increase in the fixation of the external oblique aponeurosis to the underlying muscle and conjoined tendon, but in the main there was little residual evidence of efficient conversion of weak areas of the wall into strong resistant layers. In fact for the most part there was little evidence of any residual tissue reaction of consequence. This tendency toward slow absorption of the connective tissue infiltrate has been recognized clinically with the warning that brief courses of treatment may have to be repeated after a number of months." Slobe writes in this connection: "The surprisingly firm buttress of new fibrous tissue often becomes attenuated in time, allowing the persistent sac which may not have been completely agglutinated to reassert itself even though usually to a much smaller degree."

A large number of sclerosing solutions have been used and are available for the injection treatment of hernia. Many of these preparations are proprietary and the composition of some is secret. Their active ingredients include such diversified substances as alcohol, phenol, zinc sulfate, tannic acid and soaps. In a general way their action is similar and non-specific, the differences being mainly quantitative. The trend is away from the more irritating and toxic preparations and toward the milder ones which produce a minimum of necrosis and which are followed by no serious sequelae if inadvertently injected into a blood vessel or the peritoneal cavity. The quantity to be used and the necessity for preliminary injection of local anesthetics depends upon the solution. Since similar results are obtainable from such widely varying solutions, many of which closely resemble those used during the nineteenth century, it is difficult to understand how the recent improvement in results could be due to an improvement in the solutions used, as is often claimed.

Indications and contraindications. There is general agreement among the proponents of the injec-

tion method as to the cases suitable for treatment. As experience accumulates, however, there seems to be a tendency to exclude the larger and more difficult types of hernia. Reducibility is a *sine qua non* for injection therapy. This absolutely excludes all strangulated, incarcerated, and sliding hernias. In addition, the hernia must be held in complete reduction by a well fitted truss throughout the period of treatment and for some time thereafter. Earlier writers believed the method applicable to all reducible hernias. Rice advises against the injection of hernias if the external ring is larger than 3 cm. in diameter. Crohn excludes all direct hernias, and particularly those with large defects. Wangenstein concludes that, "the small reducible, indirect inguinal hernia in the young person with strong tissues seems most suitable for this method of treatment. An anxiety to extend the method to cases that present large defects and poor tissues results in a large incidence of failure."

Age is not considered a bar to injection therapy. Infants and children have been treated, but it is frequently difficult and disagreeable to treat these young patients because of the lack of co-operation from them. Advanced age is not a contraindication. Treatment is usually not advised in marked obesity, ascites, chronic bronchitis or bronchiectasis, hemophilia, prostatism, hyperthyroidism, or mental incompetence that precludes adequate co-operation. Injection is also injudicious when other conditions requiring operation, such as cryptorchidism, large varicocele, or hydrocele are present.

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Dangers and complications Although there are many potential risks associated with the "blind" injection of irritants into the abdominal wall, the incidence of serious sequelæ in the reported series

of cases is very low. Rice tabulates 147 complications observed in the treatment of 1,020 patients. These include, in order of frequency, induration of the cord, erosion of the skin, hydrocele, general systemic reaction, coryza, edema of the leg, chemical peritonitis, epididymitis, hematoma, abscess, and gangrene of the bowel. There were no deaths in the series. Similar experiences in the hands of others give the impression that the method is comparatively safe, and that the complications that occur are, in the main, relatively mild. Serious sequelæ, however, have been seen. Berne recently reported 2 fatalities resulting from injection into the intestinal wall, with necrosis and peritonitis. Intestinal obstruction and strangulation have also been observed (Collins, McDonough). The question of sterility resulting from injections has been raised by Rea, who found normal spermatozoa in all of a series of 26 patients who had received injections bilaterally for inguinal hernia.

Results of treatment by the injection method The injection treatment of inguinal hernia will, in the final analysis, stand or fall on the results it yields. As intimated, data are not yet available to provide the answer to this question. The numerous enthusiastic reports in the literature are, of course, impressive. Those claims, however, that are unsupported by follow-up examinations cannot be accepted. Pina-Mestre, for instance, claims to have treated more than 10,000 cases over a period of twenty years, with success in 99 per cent, and Mayer reports 2,100 cases with cures in 98 per cent. Rice sent questionnaires to 57 physicians interested in the injection method, and received replies from 23 reporting a total of 2,216 cases treated. Of these, 1,914 (85 per cent) were pronounced cured. McMillan estimates his rate of recurrence at 8 per cent, but Slobe states that his primary rate of recurrence over a period of three years will run close to 25 per cent. The only statistical studies based on follow-up are those to be cited, and in these the period of observation is still short. Reporting his own results, Rice states that cures were obtained in 379 patients with 445 hernias, and only 11 failed to respond. "The cure of these cases has been determined by personal follow-up observation. No patient has been pronounced cured until the check up examination has revealed 'no impulse' for a period of 6 months after the last treatment and until the patient has been without his truss for at least four months." McKinney reports a series of 300 cases that received at least 6 injections. Of these, 230 were followed from six months to three and one-half years. Eighty-three per cent were found cured and 17 per cent not cured. Harris and White re-examined

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121 good risk cases after from six to eighteen months and found 5 recurrences (4.1 per cent) of 46 poor risk cases 9 (19.5 per cent) recurred

In striking contrast with these favorable results are the experiences of Burdick and Coley at the Hospital for Ruptured and Crippled in New York. These veteran herniologists believed the method merited a first hand trial. Before commencing the work they familiarized themselves with the technique of injecting hernias and were instructed in the method by a doctor who claimed to have had wide experience with it. A variety of the standard solutions were used individually and in combination. Their series consisted of 66 patients with 92 hernias. 66 patients were given injection treatment 4 died and 6 others cannot be traced. Among the 56 traced cases there were

| | P | I |
|---|----|----------|
| Known failures | 47 | or 81.03 |
| Possible cures | 11 | or 18.96 |
| 2 patients well for from six to sixteen months | | |
| 9 patients well for from thirteen to twenty three months | | |
| 9 of the 11 possibly cured patients are still wearing trusses and will not remove them which leaves | | |
| Probable cures | 2 | or 3.44 |

On the basis of these results they have definitely decided to abandon the method entirely.

Conclusions The injection treatment of inguinal hernia has won for itself a place in reputable medicine. Considerable scientific fact concerning it has been accumulated but the crucial question as to whether hernias can be permanently cured by the method does not lend itself to experimental proof. The method has been found reasonably safe although complications and disasters have occurred these are probably no more frequent than in similar numbers of patients operated upon surgically. It is not claimed that the ambulant treatment will replace surgery and the tendency is to exclude as unsuitable the large and difficult types of hernia. Ultimate evaluation of the method must be based on late results determined by actual follow up examination after reasonably long periods. Such data is not yet available.

SURGICAL TREATMENT OF INGUINAL HERNIA

Most surgeons the world over use the Bassini operation or one of its modifications in the repair of inguinal hernia. The place Bassini holds in the esteem of living surgeons and the importance they accord his contributions are revealed in the two-volume symposium on hernia issued by the University of Padua commemorating the fiftieth anniversary of the Bassini operation. Leading surgeons from all over the world paid tribute to

Bassini and testified as to their experiences with his methods. One fact concerning the original Bassini operation is particularly worth repeating in the light of the current attention paid to the transversalis fascia in the etiology and treatment of inguinal hernia. This is as Catterina has pointed out that Bassini attributed great significance to the suture of the transversalis fascia together with the internal oblique and transversus abdominis muscles to the inguinal ligament. This important step is omitted by most surgeons today in performing the Bassini operation and is overlooked by many of those who have modified or improved the Bassini method.

Statistics offered by different authors as to the results obtained vary so widely that it is impossible to establish accurately the merits of the current operations (See Table I). In general no consistent difference can be seen in the results of one method from those of the others in common use. This would imply that they all share the merits as well as the weaknesses of the Bassini operation. It becomes plain from a comparison of the figures reported that only those statements that are based upon actual follow up examination of the patients are worthy of acceptance. Estimates derived from impressions alone show the lowest incidence of failures. Thus Catterina claims that the incidence of failure with the Bassini method in 20,000 cases is between 1 and 2 per cent. Figures obtained by questionnaires often show a percent age of recurrence only from one half to one third as great as that found by re examination.

Judged by these criteria the results obtained from the usual methods of operation are proving less satisfactory than was formerly thought. The experience of Page is impressive. As consulting surgeon for the Metropolitan police force of London his material includes some 20,000 young to middle aged men of picked physical efficiency who are not exposed to excessive physical exertion. He states that of 295 patients operated upon for hernia 206 were re-examined from five to nine years after operation. A recurrence rate of 20.2 per cent was found in the indirect hernias and of 25 per cent in the direct. This is an interesting contrast to Ogilvie's prognoses which are probably optimistic. He estimates the proportion of cures which should be attained as follows:

| | Per cent |
|---|----------|
| Inguinal hernias in childhood | 100 |
| Oblique inguinal hernias of recent appearance in young adults | 100 |
| Oblique inguinal hernia in a old patient when the history is short and the canal apparently sound | 95 |
| Old oblique and direct hernia | 90 |

TABLE I—INCIDENCE OF RECURRENCE REPORTED WITH USUAL OPERATIONS FOR HERNIA

| Author | Cases | Followed | Indirect Per cent | Direct Per cent | Recurrent Per cent | Total Per cent | Remarks |
|-----------------------|-----------------|--------------------------------|-------------------|-----------------|--------------------|----------------|--------------------------------------|
| Abegg | 214 | | | | | 3.09 | Examination |
| Adler | 103 | 3 yrs | | | | 0.97 | Examination |
| Andrews and Bissell | 45 | | | 27 | | | Examination |
| Barth | 494 | | | | | 1.80 | Questionnaire |
| Bessin | 242 | 3 yrs | | | | 4.13 | Questionnaire |
| Birkenfeld | 166 | 1½ yrs | | | | 15.0 | Examination |
| Block | 20,199 6,024 | (collective statistics) | | | | 3-3.5 4.9 | Total series Examination |
| Catterina | 20,000 | | | | | 1-2 | No follow-up |
| Druener | 408 | | | | | 1.4 | Follow up (?) |
| Fallis | 800 200 | 3-10 yrs 1 yr or more | 7.4 | 11.6 | 13 | 8.5 | Examination Examination |
| Glenn and McBride | 305 | 6-24 mos | 2.37 | 6.21 | 30 | | Examination |
| Grace and Johnson | 784 | 1-10 yrs | 21.1 | 32.0 | 34 | | Patients all over 50 years of age |
| Groth | 683 | 3-11 yrs | 11.2 | 25.3 | | | Questionnaire |
| Huston | 1,500 | | | | | 0.8 | No follow-up |
| Iason | 50 | 1 yr | | | 13 | | Examination |
| Ledermann | 408 | 1-19 yrs | 3.2 | 4.1 | | 3.3 | Examination |
| Niessen and Potts | 88 | 3-27 mos | | | | 6.8 | Examination |
| Ostfeld | 230 | 2 yrs up | 4.3 | 20.0 | | 5.4 | 2/3 examined |
| Page | 206 | 5-9 yrs | 20.2 | 25.0 | | | Examination |
| Parsons | 244 458 | catgut / 1 yr silk (and up) | 9.8 2.16 | 13.6 4.40 | 23 7.1 | | Examination Examination |
| Schaer | 1,028 | 1'-11½ yrs | 2.5 | 6.2 | 13.6 | 3.5 | Examination |
| Spangaro | 394 | | | | | 4.5 | Examination |
| Stanton | 587 | 1-20 yrs | | | | 9.8 | Follow up (?) |
| Wachsmuth and Everken | 107 | | | | | 6.3 | Examined |

Stanton states, "Cases of indirect inguinal hernias operated upon by competent operators will, on the average, show 5% recurrences at the end of the first year and about 1% per year additional thereafter." In direct hernia he considers a recurrence of 25 per cent over a five-year period a conservative estimate.

These unsatisfactory results constitute a constant challenge that better methods be developed. Approached realistically, inguinal hernias fall into several categories. Indirect inguinal hernias in infants are merely preformed peritoneal pouches entering the inguinal canal through the internal ring. The parietes are otherwise normal. Most authorities agree that at this age simple removal of the sac is all that is necessary to effect a cure. In a recent provocative article based upon an "experience of many thousands of cases," Herzfeld advises immediate operation as early in infancy as the hernia is discovered. The cord is pulled up

through a short, transverse incision, and the sac is dissected out. A single suture across the pillars of the external ring completes the operation. With experience, she states, the operation can be done in from three to five minutes, and hospitalization is not advised.

Early hernias in older subjects present the same pathological findings as those in infants, and are amenable to the same simple therapy. With longer duration, however, the internal ring becomes stretched and dilated from the pressure of the hernial contents. At this stage, in addition to removal of the sac, the internal ring, which is an aperture in the transversalis fascia, must also be narrowed by suture. The Bassini operation is criticized by Keynes, Ogilvie, and others because, in attempting to do too much, it is injurious to beneficial structures. As it is usually performed, the repair of the internal ring is omitted. Suture of the muscles to the inguinal ligament is not only

superfluous but is ineffective and harmful as well. The failure of firm union between the muscle and fascia has been frequently commented upon. Sutures placed in the internal oblique and transversus abdominis muscles which attempt to draw them out of their normal course and fix them to Poupart's ligament can only impair the sphincteric action which they exert in guarding the ingoitus into the inguinal canal.

In very large long standing oblique hernias the anatomical changes approach those encountered in direct hernia and the repair must be altered appropriately. Due to prolonged and excessive pressure of the hernia plus often the added pressure of a truss the defect in the transversalis fascia embraces the entire inguinal floor. Furthermore the overlying muscles become atrophic and attenuated and bring the condition closer to that present in direct hernia. Therapeutically and prognostically, therefore this group of indirect hernias must be considered with the direct ones.

Direct hernia. Direct hernia constitutes a difficult and quite different problem from that of ordinary indirect hernia. It too, rests upon a congenital predisposition but one that is entirely different from that causing oblique hernia (Andrews and Bissell) and Zimmerman). The direct type of hernia develops in those individuals in whom the lowermost fibers of the internal oblique muscle are lacking and a triangular area (inguinal triangle) is left. This area is bounded by the lower edge of the muscle, the rectus sheath and Poupart's ligament and is unsupported by muscle fibers. The entire abdominal pressure is borne by the transversalis fascia and failure of this fascia results in hernia.

The inadequacies of the Bassini and allied operations for this type of hernia are obvious. The primary lesion, the defect in the transversalis fascia is ordinarily not repaired although as pointed out Bassini stressed the importance of including this structure in his triple layer brought down to the inguinal ligament. The suture of the muscles to the ligament which is the essential feature of the usual operative procedures has been shown to be of doubtful value especially in direct hernia because as Andrews and Bissell point out the pull of the rectus muscle tends to separate these structures again. That the usual methods are not suitable for the repair of direct hernia may be seen by the high incidence of recurrence listed in the accompanying table. In their paper entitled *Direct Hernia. A Record of Surgical Failure* Andrews and Bissell tabulate results from leading clinics showing recurrences in from 20 to 30 per cent. Because the patients are often worse after

an unsuccessful operation these authors advise against surgery in the usual forms of direct hernia.

Adequate repair of direct hernia should begin with closure of the defect in the transversalis fascia. Inasmuch as the basic lesion, the congenital absence of the muscle fibers cannot be corrected surgically, the resulting weakness must be compensated for by re-enforcement of the transversalis fascia with firm fascial tissue. The re-enforcing fascia should be brought into immediate apposition with the transversalis layer without tension and without interposition of fat or muscle. A pedicled flap is preferable as it retains its normal blood supply. Various measures have been described by which these requirements may be fulfilled. Andrews' white fascia operation is an undoubted improvement, but, as he states it is impossible to bring the aponeurosis deep enough to constitute the floor of the canal especially at its upper and inner end. In order for any re-enforcing flap to lie in contact with the transversalis fascia without interposition of whatever internal oblique muscle there is it must be brought up from below. Several such methods have been described. Zimmerman and Culligan use flaps from the outer leaf of the aponeurosis of the external oblique which are brought across the canal and sutured deep to the internal oblique muscle. Turner turns up a pedicled flap from the thigh which is brought beneath Poupart's ligament and sutured into position. Wangersteen advocates turning up a flap of the iliotibial tract for the repair of large defects. Free transplants of autogenous and preserved fascia have also been used. Autogenous fascial strip methods will be discussed below.

Fascial sutures. The use of autogenous fascial strips for suture material has been widely hailed as the most important contribution to hernial surgery since the advent of the Bassini operation. While this goes back to 1904 when McArthur described his method of taking strips from the edges of the external oblique aponeurosis it was Gallie and LeMesurier who popularized the procedure. Their method consists of taking strips from the fascia lata in the thigh for use as living sutures. This operation has been taken up by most of the surgeons who have found the usual suture methods to be inadequate. The fascial strips are used in several ways. If the parts to be united can be approximated without tension they are sewn together with the strips of fascia. If the defect is larger the strips may be woven back and forth basket fashion to darn the hole. Very large defects may be covered with free fascial transplants. Fascial strippers for the taking of the

sutures without extensive dissection of the thigh have been devised by Masson, Grace, and others. Davidson, Levering, and others have advocated the use of strips of peritoneum from the hernia sac for suture material.

The fascial-suture methods unquestionably have their place, but they are not without their disadvantages. The strips are thick and heavy, and require very large needles with their attendant trauma to the tissues they penetrate. The technique is difficult and cumbersome. An added intervention is needed for procurement of the strips, and herniation of muscle through the defect left in the fascia of the thigh sometimes causes discomfort. Viability of the fascial strips is still in question, and infection is much more frequent in operations of this type. That this method is not the eventual solution of the hernia problem is attested by the recent report of Burdick and Coley concerning 1,485 fascial-strip operations done at the Hospital for Ruptured and Crippled. These cases were followed up for periods ranging from one to twelve years. The incidence of infection was from 8 to 9 per cent. Follow-up examination of 975 cases revealed recurrences in 29.1 per cent. Because of these disappointing results, these authors have virtually abandoned the method.

Miscellaneous measures. A definite trend toward non-absorbable sutures is discernible. Burdick and Coley, in the article cited, state they now use silk sutures instead of fascial strips and believe the patients have a better chance of a permanent cure. In a carefully followed series of cases, Parsons reports that wound infections occurred only one-third as often in operations done with silk as in operations done with catgut, and the recurrence rate of all types of hernia was 4 times greater after the operations done with catgut. He emphasizes that silk technique requires a minimum of tissue trauma, as well as the use of non-absorbable sutures.

Division of the spermatic cord is advocated by Burdick and Higinbotham as an aid in operation upon selected cases of difficult hernia. They report a series of 200 cases in which this was done. Swelling of the testes occurred in most cases, after which atrophy took place, but in a surprising number of patients the testes remained of normal size. Andrews states that castration improves the prognosis in this type of hernia.

Conclusions. Most surgeons use the Bassini operation or one of its modifications in the surgical treatment of hernia. No consistent difference in the results obtained by these various procedures can be seen. They all yield a higher incidence of failure than was formerly anticipated, if the results are checked by follow-up examination. There

is a trend away from these methods because in the simple types of hernia they do too much, with injury to useful structures. In difficult hernias, they are not adequate. The use of fascial strips as living sutures has been adopted by most men who have found the usual methods unsatisfactory. While good results have been observed, there is evidence that this procedure has not proved to be the eventual solution of the hernia problem. Growing emphasis upon the anatomical lesion present in the various types of hernia, and an attempt to match the surgical procedure to the specific lesion point the way to better results in the surgery of inguinal hernia.

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THE LATE RESULTS OF OPERATIONS FOR RETINAL DETACHMENT

Collective Review

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IN THE nine years elapsing since Gonn reported the successful operative treatment of a large series of patients with retinal detachment the procedure has developed by a gradual evolutionary process into an accepted and widely employed form of ophthalmic surgery. Retinal separation, the cure of which was once regarded as practically hopeless, is now known to be amenable to surgery in an increasing percentage of cases. New refinements in methods and technique are being, and will continue to be, introduced. These may influence further the percentage of cures in favorable cases, but the general principles have been firmly established and almost universally accepted.

While the aim of this review is to evaluate the present forms of therapy and their end-results there will also be included a brief résumé of some of the more important articles pertaining to other phases of this subject published since 1934. These newer thoughts have, of course, a direct bearing upon the success or failure of surgical intervention. In 1935 the author (35) presented a review of the 1933-34 literature on retinal detachment, the present effort may be regarded as a supplemental report.

ETIOLOGY AND PATHOGENESIS

Since for effective treatment a satisfactory knowledge of the factors involved in the separation of the retina proper from the pigment epithelium is essential, considerable attention has been paid to the mode of production of the detachment, especially to the rôle played by the retinal tear. The elevation of the retina from the choroid in cases of choroidal sarcoma, albuminuric retinitis, and exudative choroidal disease is a mechanism which is fairly well understood, but in the so-called "idiopathic" variety, here under discussion, the exact pathogenesis still rests upon theoretical grounds.

According to Arruga (3) the predisposing factors are myopia, chorioretinitis of low degree, and senile degeneration of the retina. Arruga

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found myopia in 60 per cent of the cases. Trauma also plays a rôle. In normal eyes a very severe blow is necessary to produce detachment, but in predisposed eyes a slight blow on the eye or skull may be sufficient. There is usually an interval of time of several days, but several years may intervene. Age also plays a part. Meisner (37) found that old age and myopia predispose to detachment, the greater the myopia is, the greater the degree of detachment. Dunnington and Macnie (14), in reporting the results of 164 cases, found patients from six to seventy-nine years of age with but slight differences in the number in each decade between twenty and sixty. A positive history of trauma was obtained in 17 per cent. Fifty-three and eight-tenths per cent of the patients were myopic, 30.4 per cent having a myopia of 6 diopters or over. There was a history of contusion or other injury in 26 of 180 eyes in Meisner's series at the University of Cologne. That trauma may have a medicolegal significance is emphasized by Zenker (81) and Genet (17).

Hofe (23) suggests that congenital or localized inferiority of the retinal tissues may be the etiological factor. Zur Nedden's view that juvenile detachment of the retina may be hereditary is disputed by Velhagen (69) who emphasizes the formation of retinal cysts after slight trauma. Among other suggested factors are a sudden increase in the blood pressure, mentioned by Marshall (36), and allergy. Balyeat (8) reports a case of complete retinal detachment in both eyes in a seventeen-year-old girl who had suffered from eczema and asthma since infancy. A roentgenogram revealed calcified deposits in each eye. Prewitt (44) also reports a case of an allergic individual who developed retinal detachments in association with nodular swellings on the body, apparently following the ingestion of liver. The possibility of nodular allergic swellings behind the retina is discussed.

Leber's original idea of the pathogenesis of the disease was that because of a disease of the peripheral choroid there is a shrinking with a consequent detachment of the vitreous, progression of which puts the retina under tension and causes

the retinal tear. To this Gonin added the idea of the occurrence of the tear at the place where previous inflammation had caused adhesion between the retina and the vitreous. Lindner (30) has studied the mechanism of the formation of the tear extensively and states: "Only movements of the eye around its center of rotation are dangerous. He believes that this concept is proved histologically by the finding of a subvitreous space containing coagulated fluid."

Studies on the incidence of vitreous detachment (which according to the Leber-Gonin theory should precede retinal detachment) were made by Sallmann and Rieger (53) with Lindner's modification of Koeppe's method of slit lamp microscopy of the posterior segment. Vitreous detachment was found in 17 of 24 myopic eyes with detachment in 11 of 20 non-myopic eyes with detachment in 6 of 29 patients with myopia and a detachment in the opposite eye, in none of the patients without myopia and a detachment in the opposite eye and in 5 of 19 myopic eyes without detachment. These authors believe that these figures support the Leber-Gonin theory of the origin of detachment. Bauermann (9) describes a method for ultra-microscopic examination of the vitreous. The latter is found to be normal in some patients and to show signs of deterioration in others (cavities with liquid or amorphous contents). If the whole vitreous is liquefied then there is no pull on the retina when the eye is moved. If most of it is liquefied but small bits of gel remain intact and attached to the retina, the pulling force per sq. mm. of retina is considerable and probably sufficient to produce a retinal tear in the constantly moving eye.

Arruga (3) and others place the blame on degenerative changes in the retina itself and believe that a healthy retina never tears. It is now generally accepted (except by a small group) that the tear is the direct cause of the detachment, whether the primary pathology lies in the retina, the vitreous or both. Fuchs (16) believes that both factors are present: (1) traction and changes in the vitreous and (2) degeneration of the retina. Sugita (61) as a result of animal experimentation thinks that the liquefaction of the vitreous causes an increase of the osmotic concentration on account of the breaking up of larger molecules into smaller ones and that this increase prevails on the inner side of the retina and consequently leads to dehydration and separation of the retina. Vogt (71) believes the cause to lie in the retina itself and discusses the influence of cystoid degeneration, especially at the ora serrata. Weve (79) states that cysts are fre-

quently the direct cause of detachment. He has observed 7 eyes with large isolated cysts at the ora serrata in a series of 100 detachments.

IMPORTANCE OF THE RETINAL TEAR

If one accepts Gonin's hypothesis that the retinal tear is the cause of the detachment, the exact localization of the tear becomes of extreme importance for the plan of operative intervention. This factor was of course more important in the original Gonin operation than it is in the present mode of treatment which involves a larger area (as when diathermy is employed). Gonin claimed that retinal tears could be found in as high as 90 per cent of the cases. Meisner (37) in analyzing 180 cases operated upon at the Cologne Clinic between 1932 and 1936 is convinced that the closure of the retinal tear is the all important factor in healing. He found tears in 58 of 78 eyes with myopia and in 35 of 43 non-myopic eyes. In definitely traumatic cases 19 tears were found in 24 eyes. Most of the tears were temporal and above, next nasal and above, then temporal and below, and the fewest were nasal and below. The size of the tear would seem to be in direct relation to the state of the vitreous, with larger tears in aged individuals and in severe myopia.

Arruga (3) states that tears may be found in 95 per cent of recent cases with transparent media although in his early experience he found them in only 40 per cent of his cases. Great care and patience must be exercised in the search for them and one must not overlook tears in the upper part of the retina when the detachment (through gravity) is chiefly below. Rents in the retina may be at the ora serrata (disinsertions), semi-lunar in shape, semi-lunar with a flap, round, single or multiple or any variety of shape or form. Cole Marshall (25) urges perseverance in the search for the tear as he thinks it can practically always be found. The importance of the tear is also emphasized by Knapp (25). Peter (25) and the vast majority of writers. Gifford (19) found a tear in all but 4 of the 32 eyes he examined in 6 eyes the tear was above although the detachment was located in the inferior portion. Dunnington and Macne (14) found the inferior portion of the retina to be the site of the detachment in 50 per cent of 164 cases.

Among those who still refuse to consider the tear as the cause of the detachment is Pascheff (40). As originally advocated by Sourdille he pays no attention to the location of the tear nor makes an attempt to close it. His treatment is simply aimed at evacuation of the subretinal fluid and the production of adhesions at the site

of the detachment Rubbrecht (51) also believes the tear to be of no importance and considers that the cause of the detachment is a failure of the mechanism which naturally maintains the retina in place. The operation works by producing adhesions in the place where natural adhesion has failed. He presents some clinical evidence of this thesis.

ANATOMICAL EXAMINATION

To the relatively small number of cases studied histologically Vogt (73) adds the case of a seventy-two-year-old myopic woman. One of her eyes was operated upon unsuccessfully by katholysis and removed immediately after death, which occurred thirty-seven days after the detachment was discovered. Vogt believes that the findings furnish evidence that the detachment could not have been caused by traction because there were no signs of inflammatory changes in the vitreous. Some of the sections showed cystic decay and marked thinning and atrophy of the retina near the hole. He claims that this case substantiates his view that the degeneration of the retina is pre-existing and results in the formation of the hole from the ocular motion producing "slinging", it exerts a pull on the fibers of the vitreous attached to the thinned retina, so that the "lid" is torn off.

On the other hand, Redslob, Jeandelze, and Baudot (46) conclude from their study of 2 eyes that the vitreous has a marked influence on detachment. One eye was operated by the Gonin method and the other by the Safar method, in neither was the operation complete and the patients died twenty and five days, respectively, following the operations. Both eyes showed complete detachments of the retina with cystoid degeneration at the ora, atrophy of the entire choroid, the edges of the tears were rolled up toward the vitreous and attached in this manner by a cicatrix to the choroid, there was also degeneration of the external plexiform layers of the retinas.

Veil, Dollfus, and Desvignes (68) believe that too few cases have as yet been examined anatomically to permit exact conclusions. They agree with Gonin's view that macroscopic examination has been neglected in favor of microscopic study. Microscopic study of the retina has shown a degeneration and atrophy of the nerve layers, especially in the area of the detachment. The choroid shows a congestion in recent cases and atrophy in old cases. The vitreous shows only slight changes in recent cases but extensive alterations in those of longer duration. The subretinal

fluid in recent cases is clear and limpid, its albuminous content is not elevated, and its density is thin, almost identical with that of the normal vitreous. As time passes it undergoes degenerative changes.

Baillart, Mawas, and Tille (7) report the study of an eye removed twenty-two days after the onset of detachment because of a suspected tumor. Vascular lesions found in the choroid were believed to have caused changes in the retinal pigmented layer with cystic formation and retinomalacia, and thus caused the detachment. In histological examination of a number of eyes, especially those with severe myopia, Giannini (18) found changes in the pigment epithelium with degeneration of the retina and atrophy of the choroid in some areas, especially around the disc and at the periphery. He considers that these may be among the factors predisposing to detachment.

Based upon the anatomical examination of an eye operated on by Lindner three times within two months and removed fifteen months later because of atrophy of the bulb, Lewkojewski (29) expresses the opinion that the operation may be done too extensively. He found injury to the ciliary body and lens, with connective-tissue formation and necrobiosis of the sclera. Lindner (31) refutes this view by stating that this was the only one of his 1929 series of cases to become atrophic. Other cases were operated on just as extensively. An eye with a retinal detachment may become atrophic without surgery.

DETACHMENT OF THE RETINA AND PREGNANCY

Goerlitz (20) differentiates between the retinal detachment occurring because of toxemia of pregnancy, which is an indication for interruption of the pregnancy, and the type appearing only coincidentally, which can be treated successfully by surgery. Statistics show that in the toxic cases there is usually a spontaneous cure with the termination of the pregnancy.

SYMPTOMS

Flashes of light or floating bodies may be prodromic symptoms of detachment [Marshall (36)]. Arruga (3) states that "sometimes the diminution of vision is very rapid, without any premonitory symptoms, but in most cases the patients notice some days or several weeks before the loss of vision, the presence of floating opacities in the shape of muscæ volitantes, or black bundles resembling bunches of moving hair, probably due to the rupture of small retinal vessels at the site of the rent. At the time when vitreous opaci-

ties develop or slightly afterward photopsias appear, in the shape either of small flashes of light or of minute sparks. At other times they adopt the form of brilliant linear circles. This is probably due to places where the retina suffers a mechanical insult due to bending or wrinkling. Accompanying this is a gradual loss of vision which may not be recognized by the patient until the detachment reaches the macula.

EVOLUTION OF THE OPERATIVE TECHNIQUE

While Gonin was not by any means the first to attempt the surgical cure of retinal detachment (35) he was responsible for the development of a surgical technique utilizing it in a large number of cases and bringing it forcibly to the attention of the ophthalmological world. His operation was based upon exact localization of the retinal tear, release of the subretinal fluid and the sealing of the tear by the introduction of a Paquelin cautery through the opening in the sclera. The galvanocautery was substituted for the Paquelin cautery by Vogt and others although Gonin claimed that it offered no advantage. The disadvantages of the method are largely due to the difficulty of accurate localization of the tear in adequacy in cases of large or multiple holes (since not more than 2 cautery applications can be made at one sitting) and the danger of immediate or late hemorrhage. From the beginning Gonin stressed the importance of the tear in the production of the detachment and aimed his operative interference at it although Sourdille and others refused to support this view and obtained some favorable results by evacuating the subretinal fluid making incisions with a Graefe knife or cautery and injecting a 1000 solution of oxy-cyanate of mercury subconjunctivally.

Because of the limitations of the Gonin method especially in cases of large tears or in which no tears were found, Guist introduced the chemical cautery method. Potassium hydroxide was applied through trephine holes in the sclera made to encircle the tear or area of detachment (usually from 18 to 20 in number) and the subretinal fluid was evacuated. The chemical cauterization produced a ring of adhesive chorioretinitis now felt to be an important factor in the sealing of the retina to the underlying choroid. Lindner modified this procedure by using fewer trephine openings and undermining the choroid with a spatula 3 per cent KOH being injected between the sclera and the choroid. This method was applicable particularly to macular holes which could not otherwise be treated satisfactorily by the Guist method. Chemical cauterization has been found

to be a more satisfactory method of treatment than the original Gonin procedure but the operation is tedious and extremely difficult technically. For this reason it has been largely superseded by electrocoagulation.

Diathermy may be said to have all the advantages of the Guist method (over the original Gonin method) without the technical difficulties and it is at the present time the most widely employed. Larsson early used diathermy without perforation of the sclera allowing the subretinal fluid to escape through a trephine hole at the conclusion of the operation. In most hands this method has not been highly successful. Weve encircled the tear with a number of perforations made with a fine conical diathermy needle until he reached the retina and then turned on from 40 to 50 ma of current at each entrance. Safar used about the same technique but devised small detachable electrodes of various shapes with needles 1.8 mm long to make the scleral perforations removing them at the conclusion of the operation to allow the subretinal fluid to escape. Iridium hardened platinum detachable microprobes were introduced by Walker. Other needles have been devised by Gresser, Schoenberg (56), Gradle (21) and others.

In an attempt to measure the actual current used in electrocoagulation pyrometric electrodes have been devised (Coppez, Meesman). Klein (7) has studied the physics of diathermic coagulation by utilizing an instrument for the measurement of electrical resistance in the eye. With the perforating method he found 4 periods: (1) a period of rapid fall of the resistance which occurs as soon as the diathermic current is connected; (2) a period of steady resistance on a low level; (3) a period of sudden rise of the resistance (from the drying up); and (4) a period of carbonization of the tissues when the resistance rises to extremely high values. With constant factors of milliamperage the electrodes and the degree of piercing the process of coagulation was rather constant on repeated tests hence with known conditions the milliamperage is a reliable test of the strength of the application when checked with ophthalmoscopic results. In surface coagulation when the sclera is dry it is rapidly scorched the carbonized layer preventing deeper coagulation. The sclera should therefore be kept moistened with distilled water in this type of diathermy.

Imre Szily and Machemer (62), Vogt (70) and others have employed electrolysis with success. Vogt terms his method katholysis the cathode in the shape of a very fine needle being intro-

duced in the region of the rent and the anode being placed on the eye Walker (75), after operating on 15 cases by the Vogt method, confirms Vogt's statements and claims. In 1 case he made 126 microneedle cathode punctures carrying an average of 85 ma of current on a .006" diameter needle penetrating 7 mm. In summarizing his views on "katholysis" Stallard (60) says, "Katholysis in the surgical treatment of retinal detachment is of value for the purpose of localizing the site of the retinal hole in relation to the external surface of the sclera at the time of the operation. The cauterization produced leads to fine chorioidoretinal scars which in my opinion may be adequate for sealing small holes and for tears in the lower half of the retina but have insufficient tenacity for moderate and large holes in the upper half of the retina. Up to date none of the serious immediate and late postoperative complications which are seen in some cases treated by surgical diathermy have been noted after katholysis." The limitation of the area affected should theoretically prove most beneficial in cases of macular holes in which cauterization of a large area may lead to loss of central vision.

Szily and Machemer (62) use bipolar electrolysis with the two poles in the same handle. They (63) do not believe that there are any great differences in the inflammatory reactions obtained with the anode and the cathode in electrolysis, but they favor the anode because it gives rise to less gas (too much gas may not be well absorbed by the vitreous and may prevent reattachment). According to Machemer (32) the action of the galvanic current is chiefly chemical. Bipolar electrolysis is also favored by Hudelo (24).

Other methods of treatment proposed are the use of sutures (Rubbrecht) and of the thermophore. Reporting 4 cures in 5 cases Langdon (28) describes the use of the thermophore in treating retinal detachment. The sclera is pierced in one or two places with the Graefe knife, and the thermophore, at 168 degrees and with a 2 mm tip, is applied to the sclera for one minute around the area of detachment.

PRESENT DIATHERMY TECHNIQUE AS GENERALLY EMPLOYED

The diathermic method, now widely employed as a standard procedure, is recommended by Arruga (3) to be performed in the following manner:

Anesthesia Luminol or some similar form of pre-medication should be employed. Cocaine may be instilled as a local anesthetic although

preparations such as butyn render the cornea more transparent for ophthalmoscopic examination during the operation.

Localization The tear having been previously localized, marks are made at the limbus with gentian violet or India ink to indicate the meridian in which the tear lies. A silk suture is passed first through the more distal mark, then across the cornea, to the proximal point. With an allowance for a distance of 8 mm from the limbus to the ora serrata and an estimate of the distance of the tear from the ora (in disc diameters) with the ophthalmoscope, the suture is cut so that its end should lie over the tear. This is the method originally advanced by Gonin. A compass or other marking instrument may be employed in place of the suture.

Preparation of the field The usual aseptic precautions are observed. An incision is made through the conjunctiva and episcleral tissue from 8 to 10 mm from the limbus and parallel to it, the incision being extended to include the operative field. The tissues are dissected bluntly with scissors to expose the sclera. If necessary, one or more of the extra-ocular muscles may be cut, the ends being held with sutures for reattachment at the conclusion of the operation. The sclera must be kept dry.

Use of the diathermy apparatus With perforating diathermy punctures, either with a single electrode or the multiple electrodes of Safar or others, the needle is introduced in a ring around the locality of the tear. In flat detachments it should not penetrate more than $1\frac{1}{2}$ mm, in bulbous detachments from 2 to 3 mm. The current is allowed to pass for from one to three seconds, the number of milliamperes of current delivered at the machine varying with the apparatus. Galvanopuncture or, preferably, trephination may be and usually is employed, the trephining of the sclera being followed by application of the diathermy to the choroid, to prevent hemorrhage, and by perforation of the choroid with a spatula or galvanocautery to release the subretinal fluid and cause the retina and choroid to be apposed. At the conclusion of the operation the muscles (if severed) are reunited and the conjunctiva is sutured. Weve (78) still combines surface coagulation with multiple perforating coagulation, a modification still widely employed. He credits 2 technical details as being largely responsible for success: (1) ophthalmoscopic control during the entire course of the operation, and (2) localization of the holes by transillumination.

Ophthalmoscopic control This permits a check on the correct placing of the barrage of diathermic

punctures The site of the electrocoagulation usually appears somewhat like an active tubercle In more difficult cases one may introduce a special lancet (Arruga) at the supposed site of the tear and examine with the ophthalmoscope with this in place but it must not be withdrawn until the end of the operation because of the loss of fluid Weve devised a small periscope for sending light through the sclera with simultaneous ophthalmoscopic examination Transilluminators may be used

NEW INSTRUMENTS AND MODIFICATIONS IN TECHNIQUE

Hildreth (22) has devised a surgical ophthalmoscope to fit on the spectacle frame to assist in the viewing of the fundus during operation For operation on detachments with a hole at the posterior pole Safar (52) uses a curved electrode attached to a May ophthalmoscope Pavia (41) uses the Lange lamp applied to the scleral surface and observed through a contact glass for the localization of the retinal tear which lights up when the lamp is over it He has also (42) equipped the Lange lamp with diathermy for immediate treatment on localization which arrangement he has used in animal experimentation Van Heuven (65) has made an ingenious modification of the application of a pencil of light to the sclera by use of a glass bar through which one application of diathermy can be made under ophthalmoscopic control

Various modifications of the needles for electrocoagulation have been developed Unsworth and Larkin (64) have developed a new diathermy point based on the Lacarrere handle a fine steel wire in a glass capillary tube having a slightly curved tip the handle being made of bakelite To overcome the size which leads toward leakage and the bending of the needles for kathylosis Walker (76) has devised a strong iridium platinum needle with a diameter of $3/1000$ of an inch He claims that this gives a marked improvement in results In performing the Guist operation Wright (80) uses the Green mechanical trephine and substitutes chromium dioxide for the caustic potash

Moreu (38) stresses the importance of regulating the temperature in the diathermic procedure and believes that Coppez pyrometric electrode has defects He applies a plate like electrode 2 mm in diameter at a temperature of 80 degrees C and produces a series of non penetrating cauterizations at the site of the tear and completes the operation with 2 or 3 punctures with a Safar like electrode at a temperature of 60

degrees C Weekers (77) believes that the choroidal reaction after the use of present methods is excessive and describes an operation in which the sclera is burned almost through to the choroid in as many places as desired each spot being subsequently punctured with a ground down cataract knife

Rosengren (50) injects from 1 to 1.5 c.c. of sterile air into the vitreous to reappose the retina after the operation He reports 8 cases with cures in 6 Alvaro (2) injects blood into the orbit to immobilize the eye for a few days after the operation

POSTOPERATIVE CARE

Ocular rest is still considered extremely important in postoperative care The retina and choroid must be in close apposition for several days if adhesive choroiditis is to result After the operation atropine is instilled a binocular bandage applied and the patient is put to bed Sedatives may be employed for pain The position of the head should be such that the operated side is dependent for tears above the patient should be flat in bed for tears in inferior areas he should be sitting and if the tear is lateral he should lie on the operated side The patient should remain in bed for from five to twenty days according to Arruga (3) with consideration of the individual case and the danger of hypostatic pneumonia The binocular dressing should be continued for at least six days followed by the use of stenopæic spectacles for a considerable period Atropine should be continued The first dressing is usually done three days after the operation then on the sixth day the eye is redressed at which time a careful examination may be made

Contrary to most operators Vogt (74) has not used stenopæic spectacles as he considers them unnecessary Maggiore (33) agrees that prolonged rest in bed is important but in 2 cases the patients were allowed to go home right after the operation and good results were obtained

Veil and Dollfus (67) state that cicatrization is much slower after electrocoagulation than after thermocauterization or galvanocauterization and therefore when the former method is used the rest in bed should be longer and stenopæic spectacles should be worn for at least one month

OPERATIVE COMPLICATIONS

In the study of 154 eyes operated upon at the Vienna Eye Clinic between 1932 and 1934 Ramach (45) reports 6 cases of severe intra-ocular hemorrhage 1 after a Guist operation 3 after undermining operations 1 after diathermy and

1 after severance of a vitreous strand Seven patients had iridocyclitis after the operation, 5 had atrophy of the bulb, 6 others had complicated cataract

Schoenberg (55, 57) observed slight diffuse oozing, burning of the skin of the lids with active electrodes, traumatic abrasion of the cornea, and early collapse of the eyeball (from loss of too much fluid) as complications of the operation Post-operative complications are considered to be exophthalmos and marked chemosis from deep hemorrhage and tenonitis, copious external hemorrhage, herpes and ulcer of the cornea, hemorrhage in the vitreous, ocular hypotony or hypertension, iritis, uveitis, iridocyclitis, diplopia from defective reinsertion of a muscle or from adhesions, necrosis of the retina, orbital cellulitis, and cataract

Lundner (31) believes that the main reason that operations for retinal detachment fail is that severe intra-ocular hemorrhages occur shortly or some time after the operation Even then permanent reattachments are not impossible if the retina has returned to its normal position immediately after the operation Dunnington and Macne (14) noted vitreous hemorrhage in 11 of 164 cases, in 9 of which the retina remained detached, in 2 cases the eye was enucleated, once for iridocyclitis, and once for endophthalmitis

TREATMENT OF MACULAR HOLES

Detachments with macular holes are extremely difficult to treat surgically, because of the inaccessibility of the location and the danger of destruction of central vision Safar (52), by utilizing a curved electrode attached to a May ophthalmoscope, treated 3 cases with diathermic stippling, all healed and the patients were able to read small print Mamoli (34) used diathermy with an electric needle introduced into the interior of the globe and pushed into the proper position with ophthalmoscopic control Vogt (72) claims special merit for kathyolysis in the treatment of macular detachments as less damage is done to the retina by this method

Dunnington and Macne (14), by careful perimetric studies, found that the return of function was incomplete in all cases involving the macular region Spaeth (59) believes that detachments of the macula in which drainage cannot be effected by extramacular means are foredoomed, either because of failure of the retina to recover or because of the postoperative adhesive chorioretinitis Reese (47) offers an explanation for defective central vision following anatomically successful operations for detachment on the basis

of the existence of confluent cysts of the macula, which he believes are frequently present in macular detachments rather than a true "hole"

FUNCTION OF THE REATTACHED RETINA

Based upon anatomical examination of an eye operated upon by the Guist method, Spaeth (59) concludes that the degree of recovery possible depends, in all its details, largely on the presence of healthy rods and cones and the absence of certain irregular subretinal cells, which probably are proliferated pigment epithelial cells Clinically the condition of the retinal elements is best discovered by the visual fields for color and the threshold of light sense The greatest field loss is for blue Vision for red returns first in cases of fresh detachment, but follows the blue in cases of long standing There seems to be a strong probability that the reattached retina shows a marked pathological condition of the scotopic mechanism The light-sense threshold is disturbed out of proportion to the field loss or loss in central visual acuity Operations near the ora serrata cause the least damage to the visual field, as would be expected

Desvignes (12) made 7 observations with the skotopikometer of C Edmund and found that (1) dark adaptation was much diminished in all cases, (2) the visual peripheral field for white was nearly normal in all the cases in which there were no chorioretinal cicatrices, and (3) the visual clearness was low in 4 of the 7 cases

ESTIMATING THE PROGNOSIS, INDICATIONS AND CONTRAINDICATIONS

As a result of the extensive analyses of cases which were operated upon, it is possible to some extent to offer a prognosis as to the results to be expected Thus, the shorter the time the detachment has existed the more favorable the case Younger patients give a better prognosis than older individuals A small single tear gives a better outlook than very large or multiple tears or no tear at all Hypotony is a grave prognostic sign Dunnington and Macne (14) had 15 failures in 17 patients with a pre-operative tension below 10 mm Hg (Schiotz) Hypertension was found in 6 of their cases, 3 were cured by surgery without a return of the glaucoma Aphacia offers a poor prognosis In Dunnington and Macne's series of patients with one-half or more of the retina detached, approximately two-thirds of those operated upon within one month were cured and the same percentage of those with similar detachments of three months' duration were cured Of those with three-fourths or more of the

retina detached about one fourth were cured when the duration was one month similar results were obtained when the duration was three months. This would indicate that the extent of the detachment is of more importance than the duration within a period of three months. These authors report a case of four years duration cured by surgery. As to the type of the detachment patients with bullous separations involving not over half of the retina were benefited in 65 per cent of the cases those in which less than half was involved or in which the separation was flat in character were benefited in 77 per cent and the mixed type of separation resulted in failure in 57 per cent. Patients with a small single hole were cured in 60 per cent of the cases those with large or multiple holes in from 46 to 48 per cent and (contrary to most observers) those in whom no holes were found were cured in 54 per cent. The authors list as causes of failure:

1 Age. Patients under fifty years gave almost twice as good a prognosis as those over that age (50 per cent were under the age of fifty and 28 per cent were over the age of fifty).

2 Severe myopia. Only 48 per cent with over 6 diopters were cured, 12 per cent with emmetropia or hyperopia were cured.

3 Aphacia. Only 2 of 13 patients with aphacia were cured.

4 Hypotony.

5 Extensive detachment. There was a detachment of at least three fourths of the retina in 52 per cent of all the cases which were classified as failures after operation.

6 Multiple or very large tears. These were present in 38 per cent of the failures.

7 Changes in the choroid or retina.

Arruga (3) in a series of 300 cases had no cures in 4 cases of over two years duration, 2 cures in 12 cases of from one to two years duration, 12 cures in 29 cases of from six months to one year's duration, 10 cures in 56 cases which had existed from three to six months, 42 cures in 80 cases of from one to three months duration, 41 cures in 57 cases with an existence of from fifteen days to one month, and 50 cures in 62 cases with a detachment of less than fifteen days duration. These figures illustrate excellently the relation of the duration of the condition to the prognosis. Arruga believes that large size and a multiplicity of rents and a wide extent of detachment are next in importance in the promotion of an unfavorable result. Superior detachments are more serious than the inferior type because they involve the macula earlier. Nasal detachments are less serious than the temporal type because the optic

nerve serves as a barrier. Inability of the retina to be reapposed is unfavorable. Arruga states: 'A determination of the prognosis in a case of retinal detachment involves an evaluation of all the factors which play a rôle. For this reason each case is different. It is difficult therefore with so many factors to be considered to give the percentage of probable cure. If a young individual is selected with a flat detachment of little extent and a small accessible tear there is a 95 per cent probability of cure.'

According to Maggiore (33) good results are to be obtained in from 65 to 70 per cent of the cases. Long duration of the detachment, old age and incipient cataract which prevents a satisfactory fundus examination are unfavorable factors although this author had success in 1 case of two years' duration.

Ridley (49) reports 4 cases of a rare form of detachment which he believes offer the best prognosis, each case having been cured by a single diathermy operation. In these there was a cystic detachment without tears.

Zenker (82) reports the successful operation of a case with aphacia and nystagmus which would ordinarily be considered to have a doubly poor prognosis.

According to Weve (78), disinsertion or anterior dialysis of the retina offers the best prognosis of all types. During the past five years Weve has operated on 100 such cases with 100 per cent success. In other detachments those with tears averaging less than 2 disc diameters offer a better prognosis than those with larger holes. Among the uncomplicated cases which he operated upon during 1933 and 1934 he had a cure in all of 17 with small holes but in only 34 of 44 in which there were large holes (mostly horseshoe shaped). The cases offering the worst prognosis are those with giant holes of traumatic origin and pseudo-erethion with severe myopia.

Most operators agree with Ridley's opinion (49) that most eyes worth operating on once are worth operating on a second time if the hole remains closed. Even though the prognosis be poor unexpectedly good results are sometimes obtained (Dunnington and Macne). This is true especially if the other eye is not normal. Gradle and Meyer (21) recommend an interval of from two to three months before the second operation as some cases have a spontaneous late good result.

Allen (1) thinks that postoperative results will be improved by a thorough study of the patient prior to operation and a search for focal infections from tuberculosis and syphilis. In some cases a preliminary withdrawal of subretinal fluid may

be advisable so that holes may be better mapped out

STATISTICAL ANALYSIS OF RESULTS

Comparisons of the percentages of cure obtained by various authors and by the various methods are exceedingly difficult to make. In a true evaluation it would be necessary to answer the following questions, which is not always fully done by those reporting cases

1 Were the cases selected? The prognosis is certainly much better in patients under sixty years of age and with a detachment of under three months' duration. Patients with very old or extensive detachments, with aphacia, or who because of age, debilitated condition, or lack of co-operation cannot be kept in bed for a sufficient period of postoperative rest will show a much smaller percentage of cures. Arruga (4) claims that 50 per cent of all cases are amenable to surgery, but that if the cases are selected about 70 per cent may be cured by diathermy.

2 What constitutes a cure? A cure may be considered from an anatomical standpoint, which means a reattached retina, or from a functional standpoint, which indicates that the patient is able to see with that retina. The latter is the only type of cure of great interest to the patient. Some authors consider a vision of at least 20/200 necessary to classify a given case as cured. Dunnington and Macnie (14) classify the individuals with complete retinal reattachment and enlargement of the visual field as cured, and those with an enlarged field but with slight remaining detachment or complete anatomical reattachment and no field improvement as benefited.

3 How long has the detachment remained cured? Since there is some tendency for detachments to recur after apparently successful operations statistics given too short a time after surgical intervention and without proper follow-up will show too high a percentage of cures. While Vogt (74) has suggested that six months should elapse before a case is called cured, detachments may recur even after that period.

4 How many cases were operated upon? Results in a small series are, of course, not convincing, and Vogt (74) indicates that 200 cases should be reported if the percentage of cures is to be significant.

Early results reported by Gonin in favorable cases showed cure in about 40 per cent of the cases. Vogt (74) had about the same percentage with the Gonin method in patients operated upon between 1927 and 1929. Vogt quotes in his book the report to the Leipzig Congress of 1932 show-

ing results of the Guist chemical-cautery method, with cures in 77 per cent of the uncomplicated cases and in 55 per cent of all the cases operated upon. Weve's statistics of the diathermy method (1932-34) showed favorable results in 92 per cent of all detachments of less than two months' duration, although this figure is regarded by Vogt as almost impossibly high as there were included cases without tear which constituted a group with a bad prognosis.

An interesting comparison of methods is presented by Ramach (45) who analyzes the results of operations at Lindner's clinic for 1932, 1933, and 1934. These results show approximately the same percentage of cures from the Guist, Lindner, and diathermy techniques, both in all cases operated upon, with cures resulting in from 35 to 46 per cent of the cases, and in the uncomplicated cases, with cures resulting in from 53 to 66 per cent of the cases.

That an increase is constantly being made in the percentage of surgical cures is indicated by Baillart's (6) analysis of Weve's figures, which show the following percentages of cure

| Year | Per cent |
|---------|----------|
| 1930-31 | 48 |
| 1932 | 63 |
| 1933 | 72 |
| 1934 | 75 |

These figures probably indicate not only the improvement in technique over the period, but also the result of increasing personal experience. Weve (78) further reports cures in 80 per cent of 133 cases operated upon in 1935.

Arruga (4) states that success in operative treatment depends upon prompt execution, correct localization of the tears, and isolation of the tears by operative procedure. The method used is of secondary importance although diathermy offers the best chance for recovery, cures being obtained in about 50 per cent of the cases in which it is used.

One of the best comparative tables of results from various types of operations is that of Veil and Dollfus (66) who review five years' experience with various types of operations in 300 cases of retinal detachment. Their average of cures would be above 70 per cent if only recent favorable cases were considered. There were recurrences noted in 10 per cent of the cases following all methods of treatment. Because of technical difficulties the Guist operation has been discarded, although these authors believe that, whatever the method, there is success if obliteration, seclusion, or exclusion of the tears is accomplished.

| Method | Percentage of cures |
|-------------------------------------|---------------------|
| Obliterating thermopuncture | 49 |
| Suprachoroidal galvanocauterization | 58 |
| Juxtachoroidal galvanocauterization | 62 |
| Chemical technique (Guist) | 33 |
| Perforating diathermic coagulation | 55 |
| Pyrometric diathermic coagulation | 58 |

Schoenberg (55) also compares the percentages of cures reported by others including the original reports of the various methods as follows:

| Method | Obtained by | Percentage |
|-----------|-------------------|------------|
| Gonin | Gonin | 53 |
| | European surgeon | 39 |
| | American surgeons | 40 |
| Guist | Guist | 40 |
| | American surgeons | 47 |
| Diathermy | Weve | 65 |
| | Larsson | 50 |
| | Safar | 70 |
| | Coppex | 35 |
| | British surgeons | 47 |
| | American surgeon | 49 |

There are several facts of interest in the following table of recently reported results. We may

note a range of cures from 4 per cent following conservative treatment employed in 64 patients at the Leipzig clinic to 76.8 per cent reported by Weve in a large series of 280 patients. The average would seem to be around 50 per cent. It is to be assumed that all the series are unselected cases unless otherwise specified. Only a scattering of the many small series reported are here included as a matter of general interest. The popularity of the diathermy method will be noted.

COMMENT

Through the pioneering of Gonin and his perseverance in presenting to the profession a rational and effective treatment of a previously almost hopeless ophthalmic malady, the surgical cure of retinal detachment has become a standard procedure in eye surgery. His views on the causation of the retinal separation and the importance of the tear are still in a large measure widely accepted. His operation of sealing the tear with the cautery was superseded by the chemical cautery method which in turn was replaced by diathermy.

RECENT CURES REPORTED

| Author | Method | No. of Cases | Cases Cured | Cases Improved | Cases Not Improved | Percentage of Cures |
|------------------------------------|--------------------------------|--------------|-------------|----------------|--------------------|---------------------|
| Alt (1) | Diathermy | 8 | 3 | | | 37.5 |
| Arrig (51) | All methods (93-34) | 300 | 6 | 9 | 6 | 55 |
| Baer and Shprengel (5) | Diathermy | 44 | | | | 45.4 |
| Bergmann and Dauseld (1) | Diathermy | 3 | 5 | | 5 | 50 |
| Darmstadter (3) | Gonin | 7 | 9 | | 7 | 53 |
| Darmstadter and Maffei (4) | Diathermy | 7 | 7 | 14 | 85 | 4 |
| Gifford (6) | Diathermy | 33 | 6 | | 5 | 45.5 |
| Graden and Meyer (2) | Gonin | 9 (33) | | 6 | | 66.5 |
| | Larsson | | | | | |
| | Guist | 4 | | | | 50 |
| | Weve | 9 (3) | | | 6 | 7 |
| | Safar and Hirschfeld diathermy | 9 (35) | 3 | 5 | | 44 |
| Meyer (37) Clegg and Clark (93-26) | Larsson | 80 | | | | 67 |
| Nelson and Nasdovits (30) | Diathermy | 6 | 4 | | | 5 |
| Perrin (45) | Diathermy | 5 | 8 | | 5 | 53.3 |
| Ramach (45) and Chace (93-23) | Guist | 5 | 7 | | | 40 |
| | Larsson | 7 | 9 | | | 49 |
| | Diathermy | 6 | | | | 33.3 |
| Schultz (58) Leipzig Clinic | Conservative | 6 | | | | 47 |
| | Perrin | 5 | | | | 4 |
| | Larsson's cures | 6 | | | | 50 |
| Van Dine and Doll (66) | Diathermy | 20 | | | | 55.5 |
| Weve (78) (93-35) | Diathermy | 80 | | | | 76.8 |

largely because of its relative simplicity. New methods are constantly being advanced, of which electrolysis is the most popular, especially for macular holes, although statistics on a large series of cases are not yet available. About 50 per cent of the cases are curable by present methods of treatment in the hands of any surgeon of experience. The percentage is much better in favorable cases. Further study of the pathogenesis of the detachments and further refinements in the technique of treatment should bring further progress in the management of retinal detachment.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Sokoloff N N Combined Roentgenoneurosurgical Treatment of Salivary Fistulas of the Parotid Gland *Vestnik Khir* 1938 55 243

Single or multiple salivary fistulas may develop after a trauma or following inflammatory and necrotic processes in the region of the parotid gland. An excision of such fistulas adherent to the surrounding tissues is useless. Mobilization of the fistulous tract with implantation into the oral cavity is frequently impossible on account of the scar tissue and occlusion or excision of the fistula would require an extirpation of the parotid gland with a resulting paralysis of the facial nerve.

For the aforementioned reasons Leriche suggested neurotomy of the auriculotemporal nerve for severance of the secondary fibers: the cessation of the secretion and healing of the fistula. Kaess obtained similar results by irradiating the parotid gland with x rays. Leriche's operation does not always stop the function of the gland because the usual approach to the aforementioned nerve through the anterior vertical incision in front of the ear does not allow destruction of the secretory fibers particularly if they originate not in the temporal branches but in the common trunk of the nerve close to the median meningeal artery. Such location can be reached only after a resection of the articular process of the lower jaw which of course does not come into consideration. Kaess method does not produce permanent results and does not prevent a recurrence. Injections of alcohol into the third branch of the trigeminal nerve are not always followed by good results and are known to cause anesthesia of the involved region.

In view of such considerations the author successfully combined x ray therapy with Leriche's deprivation in 2 cases. Three irradiations were given before the operation, the total dose being 700 roentgens. A vertical incision 5 cm long extended from the lower border of the zygomatic arch upward 0.5 cm from the anterior border of the external auditory canal. The temporal artery and the nerve behind it were exposed and excised of the latter was performed by twisting it around a hemostat behind the articular process of the lower jaw. The operation was performed with the patient's mouth open in order that the space between the articular process and the auditory canal be increased. This technique allows destruction of the majority of the secretory fibers in the auriculotemporal nerve.

The patients were kept under observation for two years and during that time no recurrences were observed.

JOSEPH A. KARAT MD

EYE

Fernández I J and Fernández R F Sulfanilamide in Gonorrheal Ophthalmia. *Am J Ophth* 1938 21 763

The mode of action of sulfanilamide is not as yet clearly known. It has been proved that the drug produces bacteriostasis in streptococcus and extraocular gonococcus infections when certain blood concentrations are attained. We have observed that the gonococcus persists in the conjunctiva after the disappearance of clinical manifestations both during and after administration of the drug.

Taking everything into consideration we are inclined to believe that in gonorrheal ophthalmia sulfanilamide acts by producing a bacteriostasis which holds the organisms in check while the local and general defense mechanisms of the body mobilize against the infection. This may explain why there is no reappearance of clinical manifestations when the drug is stopped even though the gonococcus still lingers on the conjunctiva—a defense which they cannot overcome has been organized.

The authors give the following summary and conclusions:

1. All patients who received sulfanilamide treated in a spectacular manner and in a shorter period of time than that required by other accepted forms of treatment.

2. Patient with primary eye infection in whom to preexisting focus of gonorrheal infection could be demonstrated responded as well as those with secondary eye infection. It must be emphasized that the cases of primary infection of the eye failed as a rule to respond to any other type of treatment hitherto employed.

3. The results obtained in this series of cases warranted the judicious use of sulfanilamide in all cases of gonorrheal ophthalmia in adults whenever there is no serious contraindication.

4. It is highly desirable that this method of treatment be tested by other investigators to corroborate the findings.

5. More thorough investigation of the mode of action of sulfanilamide is required. The clinical findings were checked only by routine laboratory examinations (smears and cultures); the minimal effective dose has yet to be determined.

6. There has been no opportunity to treat ophthalmia neonatorum by this method but there is no reason why it should not be as effective in infants as it is in adults.

7. As the excretion of sulfanilamide is slow, smaller doses and special precautions must be used for patients with renal insufficiency as in such pa-

tients there would be a tendency toward accumulation of the drug in the blood

LESLIE L. MCCOY, M D

NOSE AND SINUSES

Donnelly, J C A New Method of Operation for Congenital Atresia of the Posterior Nares *Arch Otolaryngol*, 1938, 28 112

Congenital atresia of the posterior nares is a developmental malformation resulting in partial or complete closure of the choana. The obstruction may be unilateral or bilateral, and membranous or osseous. Today the most widely accepted hypothesis explaining this anomaly asserts that choanal atresia is dependent not only on the behavior of the bucconasal membranes and the primitive choana but on the degree of absorption of the floor of the secondary nasal fossa dorsal to the primitive choana and the degree of dorsal expansion or growth of the nasal fossa. Furthermore, the extent of the resorption of the mesenchymal tissue between the nasal and the pharyngeal epithelium determines whether the atretic mass is to be membranous, osseous, or both.

The symptoms and the problem of diagnosis of choanal occlusion vary with the type of atresia and the age of the patient. In the newborn the difficulty in breathing becomes alarming if the obstruction is bilateral, but the symptoms of severe dyspnea and cyanosis disappear when the infant begins to cry. With the mouth open oxygenation is re-established, but the impelling instinct of nasal breathing soon asserts itself, and when the mouth closes there is a repetition of the dyspnea and cyanosis. When the choanal obstruction is present on only one side respiratory embarrassment is not conspicuous but may manifest itself at nursing time.

Only in childhood or in later years is advice sought for unilateral choanal atresia. In the adult the obstruction to respiration is usually the presenting symptom, and the nasal discharge assumes a secondary rôle. In young children the reverse is true, and the constant nasal discharge is the predominating sign. Donnelly believes that the question of diagnosis would be simplified if the possibility of congenital nasal occlusion were kept in mind, but one is occasionally off guard and falls into error. He suggests the advisability of exploring the nasopharynx and the choana with a finger or instrument during all operations on the nose or throat in children, of considering the possibility of choanal obstruction when chronic unilateral nasal discharge is present, and of employing roentgenography as an aid to diagnosis.

The surgical relief of congenital atresia has been the accepted method of procedure since 1853. The operation of choice today consists in removing the obstructing wall and then taking away the posterior part of the vomer. Donnelly describes a method of simply removing the obstructing plate and inserting a skin graft on an obturator. The choanal obstruction

was first perforated with a nasal Sinnexon dilator, and then a few pieces of the bony wall were removed with a small biting forceps. The larger end of a Faulkner curet proved ideal for breaking down the remaining thin bony partition. A full thickness skin graft 2.5 cm square was removed from the patient's abdomen, and this was trimmed down to fit snugly around a No. 18 French woven catheter, which previously had been measured to equal the length of the nasal fossa from the anterior to the posterior nares. The rubber obturator was then inserted along the floor of the nose until it reached the guiding finger in the nasopharynx. The raw surface of the graft was then in contact with the freshly denuded area of the choana. A silk suture was placed in the anterior end of the catheter, which remained immediately within the nostril, and the projecting end of the tie was anchored to the cheek by adhesive tape. The postoperative care consisted of frequent nasal instillations of 1:5,000 metaphen solution. The catheter was removed on the tenth day. The patency of the posterior nares one year after operation was demonstrated by the improved resonance of the voice as recorded on a phonographic disk.

NOAH D. FABRICANT, M D

PHARYNX

Leegaard, T On the Presence of Blood in the Air Passages After Tonsillectomy *J Laryngol & Otol*, 1938, 53 499

The author presents the results of his study of the blood in the air passages following tonsillectomy, and divides his patients into 2 groups: (1) those in whom the mucosa was anesthetized beforehand, and (2) those in whom this was not done.

In 86 patients the mucous membrane was painted with a 2 per cent pantocaine-adrenalin solution. Immediately after operation it was found, by means of indirect laryngoscopy, that in 18 of these patients there was no trace of blood in the larynx and trachea, in 24, a relatively small quantity was present, and in 44, there were considerable quantities of blood and secretion.

In 7 of the 18 patients in whom no blood could be observed, the operation had been carried out with the patient in the recumbent position, the head lowest, and with the use of suction. In 3 other patients who were operated upon in the same position, blood was found in the larynx and trachea.

The horizontal position seemed a definite step in the prevention of downward trickling of the blood.

In 68 of 86 patients (80 per cent) operated upon after previous anesthetization of the mucosa, blood and pharyngeal secretion was found in a greater or lesser amount in the lower airways immediately after operation.

For the purpose of comparison, tonsillectomy was carried out in 23 patients in the same way, but without previous anesthetization of the mucosa. In 15 of these, no sign of blood was found in the larynx and trachea after operation, in 7, solitary blood streaks

could be observed and in 1 there was abundant blood

There is thus a marked difference in material solely as a result of whether or not anesthesia of the mucous membrane is used

Following the operation the patients were examined laryngoscopically from hour to hour. In the majority of cases the blood had disappeared after two hours in a few bleeding disappeared after from three to six hour

The result of these last observations is naturally of less value when bronchoscopy is not done

It appears very probable that blood and pharyngeal secretion to a large extent trickle down into the inner branches of the bronchial tree

JAMES C BRASWELL, M D

NECK

MacCollum D W. Congenital Webbing of the Neck. *New Engla d J M* 1938 219 251

Since 1833 20 cases of congenital web neck have been reported. The condition appears to be due to defective development of the neck. Early in embryonic life the region of the mastoid process lies lateral to or in a direct line with the acromial process. If development here does not progress properly the neck is apt to remain shortened. As the body grows and the shoulders assume their normal width tight bands form between the acromion and the mastoid. The fold or web is made up of skin, muscle tissue and fascia although the muscle (platysma) may be lacking in some instances.

Repair of this condition is made by means of the Z type of transposed flap. It is suggested that this Z flap be somewhat larger than that usually employed for repair of a web following injury. One side should be corrected at a time. This requires accurate

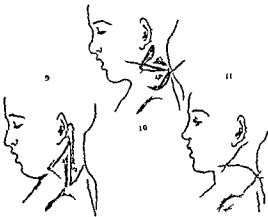


Figure 9 shows the outline of the Z incision. Figure 10 shows the transposition of the two flaps with the release of the web. Figure 11 shows the completed operation with the skin edges approximated with three continuous subcuticular sutures of No. 00000 Dermic

measurements so that the incision will be symmetrically placed when the second side is repaired. As in all plastic work hemostasis, fine sutures and carefully applied dressings are essential. After removal of the suture, neck massage beginning on the fourteenth day and continuing for at least six months is practiced. Stretching and rotation exercises are also helpful.

MANUEL E. LICHTENSTEIN, M.D.

Renton J M, Charteris A A and Heggie J F. Riedel's Thyroiditis and Its Treatment with Radium. *Brit J Surg* 1938 26 54

The authors report on 5 cases of Riedel's struma which they treated with radium. All 5 occurred in women whose ages ranged from thirty nine to seventy two years. Clinically the voice was altered in every case and there was difficulty in swallowing in 2 cases. There was no recurrence in any of the cases treated with radium for from two to five years and there was no evidence of subsequent thyroid deficiency.

The dosage varied from 1 800 to 4 000 roentgens the skin distance was 3 cm in 4 cases and 5 cm in 1 case. The duration of treatment varied from seventy two to one hundred and ninety three hours. The apparatus encircled three fourths of the neck the filtration ranged from 1 to 1.5 mm of platinum. The rapidity of the response was astonishing all thyroid swelling disappearing in two weeks.

Riedel's struma is iron hard the enlargement may be local or general. It is frequently adherent to the surrounding structures by fibrosis making surgical removal exceedingly difficult. Histologically it is characterized by lymphocytic infiltration and often by plasma cells. If these findings are extensive the epithelial elements may be replaced by the struma and if the neighboring muscles are invaded the differentiation from malignancy might be very difficult. In the parenchyma the loss of colloid is soon apparent and the epithelial elements atrophy. Some times only epithelial strands remain. Occasionally the cells enlarge their protoplasm becomes eosinophilic and the nuclei stain deeply and irregularly. The individual cell outlines are often lost and syncytial cell masses appear frequently with mitochondria. In such cases the picture might be indistinguishable from carcinoma. Fibrosis occurs early and its extent is a fair measure of the stage of the disease. The authors had no opportunity to study the tissue following radium treatment. The etiology of the condition is unknown.

FRED S. MODERN, M.D.

Newton Sir A. Toxic Gout with Special Reference to End Results. *Med J* 1st of a 1938 2 265

The author reports on 450 patients with toxic gout of whom 62 were males and 388 females. Forty six and four tenths per cent were under forty years of age. The youngest was thirteen and the oldest was seventy two. Eye signs occurred in 43 per cent of the cases.

The diagnosis of toxic goiter is easy in typical cases, but the condition may be masked by vascular changes. The most important auxiliary tests are those of the basal metabolic rate, and, in the hands of competent physicians, the administration of iodine.

All patients were prepared pre-operatively by a rest period in the hospital. They were given sedatives, calcium, iodine, Vitamin B, and an ample diet. Patients with simple conditions who required no iodine were ready in from seven to ten days. The operation consisted of the subtotal removal of the thyroid, only a small part being left over each recurrent nerve. The choice of the anesthetic varied according to the case. Seventy-six patients had been treated for a long period with iodine and in these cases surgical removal was always difficult. Fifteen patients had been unsuccessfully treated with x-rays, and in 27 patients an inadequate previous operation on the thyroid had been done.

Three (0.6 per cent) of 450 patients had died immediately after operation and 2 more died within two months, 1 of them within twenty-four hours after normal rhythm recurred, following quinidine therapy and auricular fibrillation the other committed suicide.

Among the cardiovascular complications, transient postoperative auricular fibrillation is of little significance, but if it persists more than fourteen days the administration of quinidine should be considered, although it is a dangerous drug in thyroid disorders. Congestive failure occurred in 20 patients. These were treated with digitalis and diuretics in addition to the usual measures. Twelve of these 20 patients have apparently recovered completely.

Glycosuria was observed in 20 patients, but only 4 had true diabetes mellitus, and all of these were benefited by the operation.

Exophthalmos was present in 48 per cent of the patients and its severity was usually proportionate to the duration of the disease. All of these patients should be observed during sleep to see whether the eyes close completely. A plastic tarsorrhaphy is necessary in severe cases. Mental disturbances were present in 4 patients, none of whom was benefited by the operation.

Postoperative crises occurred in 2.2 per cent. Postoperative hemorrhage can be easily avoided. The recurrent laryngeal nerve was injured in no case. Parathyroid deficiency was satisfactorily controlled with calcium and Vitamin D.

The male to female ratio was 1 to 7. The chief sex differences were a greater incidence of cardiac arrhythmia and a higher basal metabolic rate in

males. Only 7 of 62 patients did not make a full recovery.

The late end-results following the operation were as follows: 85.7 per cent of the patients were completely restored to economic usefulness and 8.3 per cent were partially restored, in 5.8 per cent the results were unsatisfactory, and in 2 patients (0.9 per cent) the results could not be classified.

Twenty-five patients developed hypothyroidism, 21 of whom were adequately controlled by thyroid therapy. In the remaining 4, thyroid therapy was inadequate.

FRED S. MODERN, M.D.

Looper, E. A. The Use of the Hyoid Bone as a Graft in Laryngeal Stenosis. *Arch. Otolaryngol.*, 1938, 28: 106.

The whole subject of laryngeal stenosis is a complicated one. For many years the greatest number of patients have been children, the condition arising secondary to improperly performed tracheotomies. Through the efforts of Chevalier Jackson surgeons have been gradually instructed in the proper method of performing a low tracheotomy, and the disease is fortunately becoming more rare. Another factor which has contributed greatly to the decrease in the incidence has been the advancement in the treatment of laryngeal diphtheria. However, because of airplanes, automobiles, and other conveyances, accidents are proportionately increasing. Injuries to the larynx are common. Lacerations are often deep, with resulting deformity and stenosis. Consequently, cases of this type have now become one of the most important problems in treatment.

Looper proposes an operative procedure in which the hyoid bone is utilized as a graft in the treatment of laryngeal stenosis in selected cases. The principle depends on embedding the left end of the attached hyoid bone between the incised thyroid cartilage, to act as a wedge in enlarging contractures and deformities of the larynx and to permit a better airway. This firm bony graft acts as a splint to weakened and deformed cartilage. The ease with which the hyoid bone can be exposed, detached, and rotated makes the procedure practical. A living, attached, and accessible graft, with the blood supply to its upper part undisturbed, has advantages over a foreign embedded graft, such as cartilage from a rib, an ear, or some other part of the body. The operation is an improvement in treatment of certain cases of laryngeal stenosis resulting from injury. It is not proposed as a perfect and immediate cure-all for every patient with laryngeal obstruction and has not been tried on children.

NOAH D. FABRICANT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Knoflach J G and Scholl R Clinic and Prognosis of Blunt Skull Injuries (Klinik und Prognose der stumpfen Schädelerietzungen) Arch f Klin Chir 1937 190 45

This is a very comprehensive work based on 1146 clinical observations of blunt skull injuries (concussion contusion and fracture) with 570 follow up examinations

The male to female ratio was 2 to 1. Most of the patients were between the ages of 0 and 30 years (27.6 per cent). Traffic accidents were responsible for the greatest proportion of the cases (53 per cent). Concussion may be classified as (1) uncomplicated slight and severe and (2) combined with contusion or various types of fracture. Contusion may be classified as (1) uncomplicated and (2) combined with concussion and various forms of fracture. There were 789 cases of concussion 361 of which were severe. Six patients with severe concussion of the brain died a mortality of 0.76 per cent. The incidence of slight brain concussion severe brain concussion and brain contusion was 35.45.8 and 19.2 per cent respectively. In uncombined brain contusions there was a mortality of 6 per cent and in contusions combined with other injuries the mortality amounted to 54.5 per cent. Patients with fracture of the base of the skull died from cerebral injury (28 per cent) those with fracture of the vault had a low mortality (3.8 per cent) and of 93 patients with fracture of the facial portion of the skull only 1 died.

There is a thorough discussion of the symptoms. The duration of unconsciousness is not a criterion of the prognosis amnesia is not a constant sign of concussion and does not necessarily parallel the degree of unconsciousness and the disturbances of the pulse, headaches, morphological blood picture, cerebral nerve injury, pupillary symptoms, peripheral sensibility and motor disturbance, hemiparesis, roentgen examination.

There is a thorough discussion of the cause of death. Death in cases of brain concussion was due according to the post mortem examination to lung complications or a secondary injury instead of to the cerebral injury. On the whole various complications especially meningitis, fat embolism and lung pathology played important parts in the post mortem findings. The highest mortality occurred in comminuted fractures (vault and base) due to the extensive cerebral involvement. Pulmonary complications often occur in skull injuries. Also in cases of injury with a short period of unconsciousness bronchopneumonia frequently developed between the fourth and seventh days. Wortis and Foster also observed pneumonia in 7.2 per cent of all cases of skull injury death occurring in nearly all of the 7.2

per cent. The frequency of fatal meningitis is about 1.4 per cent.

Another section of the article was devoted to the subject of the accompanying injury. Treatment was discussed fully. Lumbar puncture of diagnostic as well as therapeutic value was carried out only in serious cases and then only very cautiously. Operative treatment was carried out in 56 cases of compound fracture with 5 deaths (8.1 per cent) and in 6 cases of closed fracture (depressed fracture) with 5 deaths (8.1 per cent). Twelve operations were performed for intracranial hemorrhage 7 followed definite clinical diagnosis following previous exploratory punctures. Of the 6 patients with epidural hemorrhage 2 died. Of 5 patients with hemorrhage (mostly originating in the base) 4 died. The post mortem findings are discussed in detail. Late deaths played a secondary rôle in the prognosis as well as late hemorrhages which are very rare.

If one considers the number of deaths occurring during treatment, the late deaths that are a sequence to the injury and the permanent disability the result is astonishing and shows that 203 of 1000 skull injuries have a poor outlook. The post mortem findings were discussed from the standpoint of a single injury. There is also a discussion of the objective distinguishable lasting injuries with especial consideration of the disturbances of the sensory organs, the permanent paralysis of the cerebral nerve, the post traumatic psychic disturbances and post traumatic epilepsy.

(WANKER) RICHARD J BENNETT JR MD

Henderson W R The Anterior Basal Meningiomas Brit J Surg 1933 26 124

In the presentation of the case histories of 6 patients observed at the National Hospital, London, the author illustrates several new items of clinical interest: the technical difficulties encountered during operation and the use of certain operative procedures which facilitate the removal of meningiomas from the floor of the anterior cranial fossa.

The difficulties experienced by the patient and surgeon alike are the result of two important factors: the precise histological type of the meningioma and its particular location. The nodular psammomatous solid meningioma with a small dural attachment offers less of a problem even when in a location of greater disadvantage than a nodular but highly angiomatous type of tumor. The meningioma en plaque obviously when spreading sheet like over the floor of the cranium offers a wide variety of difficulties because of the important basal structures it may incorporate and because its complete removal may be mechanically impossible.

The clinical diagnosis of meningioma depends more upon extracerebral signs such as cranial nerve involvement and x ray evidence of bone change

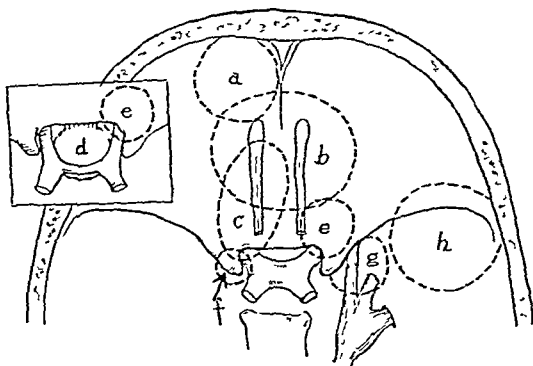


Fig 1 Diagram of the anterior cranial fossa to show the relative positions of the various anterior basal meningiomas before they have attained a large size a, pre-olfactory, b, anterior olfactory, c, posterior olfactory, d, tuberculum sellae, e, upper surface of lesser wing, f, anterior clinoid, g, inner part of sphenoid ridge, h, outer part of sphenoid ridge near the pterion The olfactory, optic, and trigeminal nerves are shown

than upon signs of intracerebral damage Early visual disturbance or actual rapidly progressing blindness are more common in patients with meningiomas than are the symptoms of a lesion within the cerebral hemispheres, namely, aphasia, hemiparesis, dementia, stupor, and incontinence Henderson states that calcification within the substance of a meningioma is comparatively rare, it being more commonly seen in gliomas

Anterior basal meningiomas should not be thought of as "olfactory groove" meningiomas alone Meningiomas of the anterior fossa may, indeed, arise not only from the cribriform plate, but also from the sides of the crista galli, tuberculum sellae, upper surface of the lesser sphenoidal wing, anterior clinoid process, or anywhere along the crest of the greater sphenoidal ridge (Fig 1) These tumors, according to position, may present two types of clinical history, a long history of focal symptoms if the tumor be closely related to an important structure from its beginning, or a relatively short history of increased intracranial pressure, with a tumor which may be pushing a "silent" area ahead of it in its growth, without the production of localizing signs Anosmia is a frequent symptom, second to which in frequency is bilateral visual failure or actual monocular blindness, depending upon whether or not the tumor directly involves the optic nerve Anosmia coupled with positive x-ray findings is confirmatory of the lesion's location, but too much dependence should not be placed upon the roentgenogram alone, for quite frequently meningiomas of great size do not show any notable bone changes The Foster-Kennedy syndrome has been found in only 2 of 12 cases of meningioma confined to the olfactory groove, which is in marked contrast to its generally accepted frequency



anterior tumor
clinoid origin

Fig 2 Drawings to show the stages in the removal of a large vascular meningioma growing from the upper surface of the lesser wing A, bipolar coagulation of the tumor which was exposed after resection of the frontal lobe, B, excavating the hardened tumor with the diathermy loop, C, separating the final shell of tumor from its attachment, D, the empty anterior fossa showing the tumor origin and the eroded anterior clinoid, E, diagram showing the tumor (horizontal shading) and the resected frontal lobe (oblique shading)

In view of the great technical difficulties which are encountered in the removal of meningiomas of the floor of the anterior fossa, several surgical devices were employed in the author's cases Partial resection of the frontal lobe was occasionally done, preliminary subtemporal decompression was found sometimes to be of immense aid, bipolar coagulation of large, vascular tumors was done to render their removal more bloodless and to allow their gradual reduction to a shell which could finally be cleanly wiped from the brain (Fig 2) A bifrontal bone flap, allowing a wide exposure of the frontal lobes and their elevation from the floor, facilitated removal of the tumor in several cases JOHN MARTIN, M D

Hyndman, O R · Tic Douloureux. Partial Section of the Root of the Fifth Cranial Nerve, A Comparison of the Subtemporal and Cerebellar Approaches from Surgical and Physiological Standpoints *Arch Surg*, 1938, 37 74.

A brief description is given of the technique of the subtemporal and the cerebellar approach used in partial section of the root of the fifth cranial nerve The author has devised a special guillotine knife to

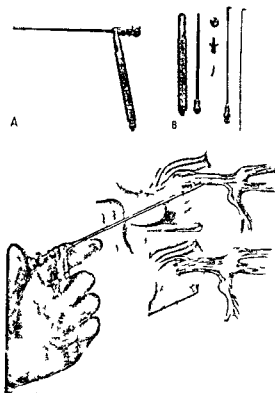


Fig. 1. Guillotine knife. A knife assembled. The tiny blade moves freely into a slotted guard when the thumb button is pressed. The blade returns by spring action. The blade was designed so that its length would be equal to only half the width of the average sensory root at the pons. B parts of the instrument. Left to right: handle set screw by means of which the blade shaft may be rotated at any angle to the handle; thumb screw which fixes the blade rod; blade rod guide spring; blade shaft with terminal slotted guard (made from lumbar puncture needle); blade made from piano wire. This may be easily and inexpensively renewed from time to time if necessary. The instrument should be sterilized in the autoclave. The drawing below illustrates the use of the instrument. The insert shows the section completed.

produce a clean accurate cut without undue injury to the nerve (Fig. 1). He compares the advantages and disadvantages of the two methods of exposure from a surgical standpoint and concludes that the cerebellar approach although requiring more technical skill and experience permits a more bloodless and dependable operation. He believes that from a physiological standpoint it probably makes no difference where the root is sectioned provided that comparable sections are made. A greater loss of sensation has followed section by the subtemporal route than by the cerebellar route probably because

a more extensive section is carried out. He believes that a partial section of the root which can be well controlled by the guillotine knife described may be done to eliminate pain crises in the second and third branches without appreciable loss of sensation in the face as noticed by the patient. In the presence of pain in the second and third branches a total section of the sensory nerve is unnecessary and should be considered an obsolete operation. The author concludes that it makes very little difference from a physiological standpoint in regard to the formation of corneal ulcers and the retention of sensation whether the cerebellar or subtemporal approach is used provided that comparable sections are made in the root of the fifth nerve.

ROBERT ZOLLINGER M.D.

SPINAL CORD AND ITS COVERINGS

Slaczka A. The So Called Neuro Epitheliomas of the Central Nervous System Including Observations on the Pathogenesis of Hydromyelia Syringomyelia and of Neurinomatosis (Ileer die s.g. Neuroepitheliome des zentralen Nervensystems (nebst Betrachtungen ueber die Pathogenese der Hydromyelia der Syringomyelia und der Neurinomatose). B II s. ternat de l'Academie Polonaise de sc et d lettres 1937 p. 247.

The neuro epithelial tumors according to Conheim are new growths arising from «pongioblastic groups which are remnants of fetal nerve tissue. They form a link in a chain of dysontogenetic disturbances and often occur with other developmental anomalies. The spinal neuro epitheliomas nearly always are associated with syringomyelia often with hydromyelia and occasionally with neurinoma of the roots and of the peripheral nerves. In one case neuro epithelial tumor hydromyelia syringomyelia and characteristically systematized nerve root neurinoma were found together.

The analysis of this anatomicopathological syndrome substantiates the theory of Bielchowski. Rose and points especially to the neurogenic origin of neurinoma. It also stresses the belief that syringomyelia arise from developmental disturbances. A unique picture of neuro-epithelioma one never noticed to date was found in another case. In the neuro epithelial tissue there were islands of shrunken hyaline cartilage tissue which probably dated from the primary medullary cord as a result of misplaced parts of the Membrana reunions.

Evidently the theory of developmental disturbances is not sufficient to account conclusively for the pathogenesis of neuro-epithelioma. Some researchers emphasize the exogenous influences (trauma hemorrhages and toxic and inflammatory conditions) which in their cases may have been the etiological factors. Marburg speaks of a developmental constellation. In the author's second case the history showed an initial pyrexia that preceded the sickness. However he does not wish to attach any special importance to this fever. If one considers the cases of

Opalski with their powerful reactions into gliafornations, which hardly are distinguishable morphologically from subependymal gliomas, then the possibility of exogenous influences in the author's cases cannot be ruled out

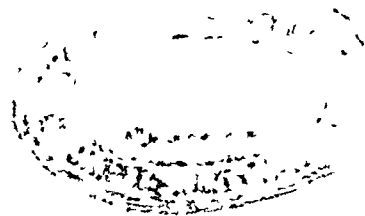
Summarizing from all cases described, neuro-epithelioma is more common in men than in women. It may occur in the most unusual periods of human life which, consequently, precludes the fixing of a predestined age for the appearance of this tumor. The youngest patient on record was four years old, and the oldest sixty-three years old. Some of the many varying terms applied by different observers follow: ependyma adenoides gliosarcomatosum (Benda), adenoma ependymale (Babes), epithelioma gliosum (Friedmann), spongioblastoma (Ribbert), neurinoma

epitheliale (Orzechowski-Nowicki), blastoma ependymale (Marburg), ependymoglioma (Roussy-Lhermitte-Cornil), and ependymoma (Kernohan-Woltmann-Adson)

Discussions justifying the terminology of these tumors are given

Why in one case the whole tumor tissue remains in the status of a characteristic neuro-epithelioma, and, in another case develops, either in part or *in toto*, into ependymoglioma cannot be explained at present. Perhaps it is merely a question of time. It is possible that all neuro-epitheliomas would eventually develop into ependymogliomas, if, as in many cases, a "premature exitus" did not occur before this period of development was reached.

MATHIAS J. SEIFERT, M.D.



SURGERY OF THE THORAX

CHEST WALL AND BREAST

Lazzarini L. *The Mastoses (Le mastosi)* Clin chir., 1938 14 371

Lazzarini includes under the term mastoses all those pathological changes of the breast which are clinically characterized by the appearance of painful nodular tumefactions of this organ.

Anatomicopathologically the lesions are of the proliferative degenerative type involving the entire breast tissue. The final stage is characterized by sclerosis of the connective tissue and by the formation of cavities and cysts involving the acinic tissue and the tubules.

A host of names has been employed to designate this clinical entity the etiology of which is still completely obscure. The most commonly employed terms are chronic cystic mastitis, Schimmelbusch's disease, cystic fibro adenomatosis and interstitial mastitis.

In the author's opinion the term mastosis is the most appropriate one to designate this so common condition among women.

A vast number of theories have been advanced to explain the cause of this breast involvement and with the advent of endocrinology many interesting facts have been revealed which clarify somewhat the intricate relationships.

In Lazzarini's opinion the condition is due primarily to an ovarian involvement characterized by a disturbance of equilibrium between estrone and progesterone. In a later stage this condition becomes associated with a dysfunction of the thyroid gland. This is proved by the fact that the administration of diiodotyrosine (anti thyroidin) often benefits the patient and also by the fact that patients entering only an ovarian dysfunction rarely develop a mastosis.

According to older theories the disease is believed to be due to inflammatory and neoplastic processes and to congenital malformations but in the light of recent evidence these theories have been definitely discarded.

Anatomicopathologically this breast condition is characterized essentially by (1) proliferation of the epithelial cells of the acinic tissue of the tubules and of the lactiferous ducts (2) hypertrophy and lipodivacuolar degeneration of the individual cells and (3) hyperplasia and degeneration of the connective tissue of the breast. The changes are the forerunners of conspicuous dilatations of the acinic tissue which may finally assume the character of veritable cysts. Great care should be exercised not to confuse this condition with carcinoma of the breast.

Concerning the symptoms patients usually complain of a tumefaction of one or both breasts associated with stab-like pain occurring as a rule a few

days preceding the menstrual flow. In women past the menopause the condition is sometimes characterized by the presence of a small nodule. The mastoses are usually encountered in women between thirty five and forty five years of age but also occur in younger individuals shortly after puberty and sometimes in elderly women past the menopause. As a rule the disease is found in tall women with disproportionately large breasts who are irritable and oftentimes sexually frigid. In almost all cases there are associated menstrual disturbances such as dysmenorrhea, scanty menstrual flow, irregular periods and complete amenorrhea. Almost always a dysfunction of the thyroid gland is present which however may be so slight as to escape detection. In many cases there are definite signs of hyperthyroidism such as loss of weight, irritability, tachycardia, tremors, enlargement of the thyroid, an elevated basal metabolic rate, increased pulse pressure and abundant stools.

The most important sign however is the tumefaction of the breast which usually involves the upper and outer quadrant. The nipple is usually not involved. The diagnosis is made by simple palpation. It should also be noted that the axillary lymph glands are not involved as a rule. Occasionally a few enlarged glands may be present but this finding is coincidental.

The disease is characterized by an oscillatory course in which periods of remission alternate with periods of exacerbations. It is by no means uncommon to observe malignant transformation.

The diagnosis is made on the basis of the combined thyroid-ovarian dysfunction, the presence of a painful tumefaction of the breast recurring periodically, the irritable state of the patient and the characteristic palpatory findings. The mastoses should be differentiated from (a) fibro adenoma, (b) epithelioma, (c) lipogranuloma, (d) calcified breasts and (e) tuberculosis and syphilis of the breast.

The therapy may be either hormonal or surgical. The hormonal therapy includes the oral administration of estrone (theelin) in doses of 500 international units daily. This therapy is combined with the administration of anti thyroidin (Moebius) given in doses of from 10 to 15 drops daily. Under this form of treatment the patient shows marked clinical improvement within a short period of time. The surgical treatment includes two operations of choice: (a) simple excision of the nodules and (b) amputation of the breast with or without removal of the axillary lymph glands.

The author firmly believes that the medical treatment should be given preference and surgery should be performed only if there is reason to believe that the lesions are undergoing malignant changes.

RICHARD F. SOMMA, M.D.

Shepherd, W F Carcinoma of the Breast A Review of 439 Cases. *Arch Surg*, 1938, 37 190

The diagnosis of mammary carcinoma is becoming more difficult inasmuch as patients are consulting medical advisors earlier in the course of the disease. This is true particularly when the women are between the ages of thirty-five and fifty, when fibroadenoma, cysts, mastitis, and fat necrosis must be considered.

The author does not regard cystic disease as precancerous. In the case of solid tumors he advises microscopy, and it is his opinion that diagnosis will be impossible in from 10 to 20 per cent of instances without this aid.

Lymphadenopathy is important with regard to the prognosis. Gross evidence of lymph-node involvement may not be noted in some cases, but microscopic sections may reveal the presence of metastatic cells.

Definite metastases in the supraclavicular region and large extensions to the axilla are regarded as contraindications to surgery, primarily because life is endangered, and also because subsequent deaths from this unnecessary procedure will discredit surgery in the minds of the laity. In 7 per cent of the author's cases, the tumor was inoperable.

Continued education of the public is advised. There have been some objections raised to this, but it is Shepherd's opinion that the imaginary horror produced by such advertisement is much less harmful than the actual terror accompanying malignant disease.

A radical operation is advocated consisting of removal of the breast in one piece, removal of the pectoralis major and minor muscles, as well as removal of all the contents of the axilla except the vein, artery, and brachial plexus. The deep fascia should be removed from the clavicle to the epigastrium and from the sternum to the latissimus dorsi, according to the author.

The most effective means of saving life and ameliorating suffering from cancer of the breast at the present time lies in the early diagnosis of the lesion and its prompt removal by radical treatment.

ALTON OCHSNER, M D

Trout, H H The Treatment of Carcinoma of the Breast. *J Am M Ass*, 1938, 111 489

While many articles have been written on the possible association of chronic cystic mastitis and carcinoma of the breast, the author does not believe that there is any definitely proved evidence of such a relationship. Before any such connection can be determined there will necessarily have to be a more definite and generally accepted definition of what constitutes a case of "chronic cystic mastitis." Some pathologists report chronic cystic changes of the breast in practically all post-mortem examinations. Every case of painful chronic cystic mastitis, especially with an increase in the size of the breast, should be carefully watched. If the condition does not yield to the administration of estrogen and

proper support of the breast, serious consideration should be given to amputation of the breast with immediate microscopic examination. This is important especially if the trouble is unilateral.

Carcinoma of the udder of the milk cow is practically unknown, while a malignant growth in the breast of a dog is quite frequent. The foreign-born wives of miners who nurse their babies for long periods have a very much lower incidence of cancer of the breast than the American-born wives who nurse their babies for a shorter period.

The fact is now generally accepted that inheritance is a definite factor in the cause of cancer but naturally we cannot control the "selective affinity" in human beings as we can in domestic animals.

Much has been written concerning the relative advantages of surgery and irradiation in the treatment of carcinoma of the breast. Instead of being regarded as rivals these two agencies should be combined, provided this can be done without injury to the patient. Much harm can be done by ill-advised and improperly executed surgery, as well as by unreasonable and dangerous irradiation. It is hoped that the new x-ray-tube arrangement described recently by Faila of the Memorial Hospital, New York, will decrease the cost of proper irradiation therapy as well as extend the field of its accessibility. There will never be a wide adaptation of irradiation and surgery in the treatment of carcinoma of the breast until there is an arrangement by which the patient will know fairly accurately the total cost for the combined forms of treatment. Every patient with carcinoma of the breast should have not only a proper examination made of her physical condition and the extent of the disease but a careful estimate made of her mental ability and willingness to co-operate in the treatment over a long period of time.

The author believes that pre-operative irradiation should be given in each case, provided it can be done without any injury to the patient. Coutard states that it would be rational to irradiate first and operate later, because there is very frequently an association of young and adult cells. This would give the surgeon added security in his operation. "The surgical intervention could be accomplished before the possible appearance of new, young cells, that is to say, before the twentieth day, and in any case before the slight skin reaction of the twenty-fifth day." Radiologists believe that the beneficial effects of irradiation are dual in character: (a) they act directly on the cancer cell itself and (b) they confine the activity of the malignant condition by means of developing fibrosclerotic connective tissue around it. Such a defense also diminishes the nutrition to the cancer cells, and often results in the death of such isolated cells. Pfahler has recently described a form of treatment which requires only forty-eight hours before operation. It is reasonable to presume that pre-operative irradiation makes any young active and unattached cancer cells somewhat dormant, at least, and thereby less apt to be transplanted by

manipulation during the operation. At the present time the advisability of the employment of preoperative irradiation is an unsettled question.

For the removal of the malignant growth from the chest wall the author prefers the radical excision by block dissection. The author does the Halted operation with a few modifications. In cases in which the diagnosis is doubtful he obtains his specimen for microscopic examination by the employment of the cautery so as to lessen the chances of contamination. If examination of the specimen demonstrates that the growth is malignant the field of operation is cleaned after a sponge has been sewed over the incision from which the specimen has been removed. This of course is done to preclude the possibility of contamination of the operative field with any possible stray cancer cells.

While the author has found no recurrence of carcinoma in the scar since using irradiation he has found a continuation of the malignant growth when the carcinoma was shown to extend through the intercostal spaces at operation. The irradiation of the chest wall cannot be allowed to penetrate very deeply because of the danger of great damage to the lungs. Ahlborn of Stockholm who has been irradiating the ovaries in all women with carcinoma of the breast since 1930 believes that his results justify the continuation of this practice. Many other authors also believe that this is important. They point out that most carcinomas of the breast start after the menopause and they reason that the ovaries might release some carcinogenic substance more readily after they have ceased to control the menses than they did while actively engaged in the regulation of menstruation. It is possible that in the near future a chemical study of the blood for carcinogenic substances will put some light on this subject.

ELLA M. SALMONSEN

TRACHEA LUNGS AND PLEURA

Overholt R H and Tubbs O S. Extrapleural Pneumothorax in the Treatment of Pulmonary Tuberculosis. *J Thoracic Surg* 1938 7: 591.

The advantages of air over solid fillings following an extrapleural pneumonolysis are given by Overholt and Tubbs as follows: (1) The extent of the collapse may be controlled to a certain degree after closure of the wound by either injection or with drawal of air. (2) A more extensive collapse may be obtained as large amounts of air do not tend to perforate the lung or gravitate toward the diaphragm as do similar amounts of wax. Failure to close cavities by plompage is usually attributable to a limited and insufficient separation of the pleura from the chest wall. The surgeon realizes that an extensive separation would require more wax than can be safely used. (3) Air has less tendency to produce a local reaction than a solid foreign body such as wax. (4) Experience has shown that wax even in small amounts may at some later time perforate into the lung.

The authors report their experience in a series of 31 operations begun in October 1937. The patients selected for extrapleural pneumothorax were those for whom no other form of collapse therapy offered any hope of a successful outcome. Overholt and Tubbs stress their opinion that extrapleural pneumothorax cannot replace modern selective thoracoplasty but is an alternative method when the latter is contraindicated.

They divide the patients unsuitable for thoracoplasty into three groups. In the first the lesion is too active. In the second there are extensive bilateral lesions of a fibrocavernous nature and in the third factors complicating pulmonary tuberculosis such as asthma and generalized emphysema are present.

For their operative technique they consider cyclopropane to be the anesthesia of choice as it provides for such quiet respiration. They subperiosteally reflect 4 in. of the posterior part of the fourth rib after making a liberal paravertebral incision. After careful incision of the peritoneum the plane between the parietal pleura and endothoracic fascia is entered and the separation carried out by means of blunt dissection under direct vision. The separation is carried down to a horizontal plane two segments below the radiologically lowest limit of the disease. After washing the extrapleural space with warm saline solution an air tight closure of the chest wall is made. The pressure within this space is then measured and air injected if necessary until the pressures fluctuate through a mean of zero.

After the operation the patient is usually in such good condition that the sitting position can be maintained so as to prevent a blood clot from causing adhesions between the apex of the lung and the parietes. (Interstitial emphysema is constant but of short duration. No case of atelectasis of the uncollapsed lobe developed.)

A bedside roentgenogram is taken of the patient sitting upright on the day after the operation. Usually it is found that the lung is not collapsed to the operative level and a refill has to be given. Air is introduced until the pressures oscillate through a mean of zero. Further refills have been given on the second, fourth, sixth, ninth and twelfth days the pressure being kept the same. The intervals become rapidly longer. The authors are opposed to the use of high positive pressure as they fear the production of bronchial fistulas.

The usual hemorrhagic exudate forming in the extrapleural space is removed only if it is slow in being absorbed. When blood is present and cannot be aspirated with a needle it should be removed through a catheter after the insertion of a trocar and cannula.

Infection of the extrapleural space occurred in 4 cases in 3 of which there was definite evidence of a broncho-extrapleural fistula. In some instances the fistula develops as a result of necrosis of a portion of the lateral wall of the cavity following the loss of its blood supply from vascularized adhesions of the chest wall. In 1 patient with a giant cavity per-

foration was caused by the introduction of the pneumothorax needle at the time of the first refill after operation

The authors believe that most of the patients of their present series will eventually require conversion of the extrapleural pneumothorax into the permanent collapse of thoracoplasty

RICHARD H. MEADE, JR., M.D.

Loubat, E., and Magendie, J. The Use of Tannic Acid in Thoracoplasty to Retard Rib Regeneration (De l'emploi du tanin dans les thoracoplasties pour retarder la régénération costale) *Bordeaux chir.*, 1938, 9 133

The regeneration of ribs, in whole or in part, has continued to be an annoying problem in chest surgery, especially in thoracoplasty as a therapeutic measure for pulmonary tuberculosis. Various observers attribute this persistent re-ossification to different factors to the marrow which is exposed at the cut, denuded bone end, to the periosteal lining of the rib cavity (a subperiosteal resection having been done), to the exposed cartilage at the anterior rib ends, to the aponeurotic and ligamentous fragments left in the rib bed, which tend to act as foci of ossification, and to postoperative hematomas, lymphatic extravasations, and lacerated muscles, all of which, in the presence of infection, hyperemia, and edema may tend to ossify. The authors believe that the periosteum, the torn ligaments, the postoperative hematomas, and the torn muscles are the most important factors in costal regeneration. They emphasize how much such regeneration defeats the purpose of the original thoracoplasty, how it calls for repeated operation to allow more complete lung retraction, and how, eventually, the patient suffers because of delayed operative benefit.

Using 42 dogs, the authors tried various agents to prevent costal regrowth in the beds of ribs which had been removed by subperiosteal resection. Electrocoagulation gave varying results and caused adhesions to the visceral pleura. Ten per cent formalin, Bouin's solution, 1 and 10 per cent chromic acid, and 2 and 10 per cent silver nitrate gave inconsistent results and often caused severe ulceration and inflammatory changes. Methylene blue, gentian violet, phosphoric acid, trisecol in alcohol, and alum were all found to be either ineffective against re-ossification or too toxic for practical use. However, 20 per cent tannic acid in alcohol-water solution gave such excellent results experimentally (Fig. 1) that it was tried on patients. The case histories of 2 are given.

After a careful subperiosteal resection the bed of the ribs and the cut rib ends were thoroughly swabbed with a 20 per cent solution of tannic acid in alcohol and water, and the wound was closed with drainage. Rib regrowth has been consistently stopped for many months, except in 1 patient who at the end of five months began to show small flecks of calcium along the former rib beds. The authors encountered no ulcerations, no toxic symp-

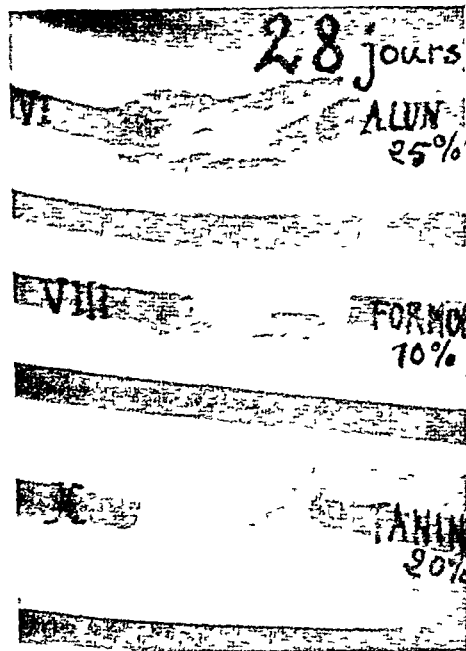


Fig. 1 Rib regeneration after twenty-eight days (alum 25 per cent, formalin 10 per cent and tannic acid 20 per cent)

toms, no thromboses, and no serious brachial plexus injuries (in high thoracoplasties) in their use of tannic acid. One patient, however, showed a slight atrophy of the thenar eminence after the application of tannic acid in a high thoracoplasty.

The low toxicity of 20 per cent tannic acid, its toleration by the tissues, vessels, and nerves, and its consistent prevention of ossification make it much more preferable than the customarily used formalin, and it does not cause slow bleeding from the rib bed, as may be found after the use of formalin. The authors are enthusiastic in their expectations of this new treatment, and they offer it as a satisfactory answer to the problem of rib regeneration.

JOHN MARTIN, M.D.

Sussman, M. L. Non-Putrid Pulmonary Suppuration. *Am. J. Roentgenol.*, 1938, 40 22

The purpose of this report is to review the roentgenological features of suppurative bronchopneumonia, particularly those of the more severe forms of the disease.

Suppurative bronchopneumonia is defined by this author as a pneumonitis due to non-putrefactive pyogenic bacteria with the formation of pus in, and sometimes necrosis of, the bronchial walls and pulmonary parenchyma. The disease occurs most often as a complication of purulent sinusitis, whooping cough, measles, influenza, and grippe, and after the aspiration of foreign bodies and secretions, as in

postoperative pneumonia Abscesses when formed are usually multiple in contrast to gangrenous lung abscess which is single. Most striking is the rapid organization of a layer of fibrin which generally covers the pleura. This results in the formation of thick red vascular granulation tissues on the pleural surfaces. Adhesions are quickly made permanent.

Suppurative bronchopneumonia is characterized by a tendency toward spontaneous resolution and most cases go on to complete restitution.

Fifteen cases are discussed in adequate detail and profusely illustrated with roentgenograms. The findings of roentgenological importance are discussed.

In its early stages suppurative bronchopneumonia has no features which differentiate it from other forms of bronchopneumonia. In the mild cases resolution takes place promptly.

In the course of a bronchopneumonia the roentgenogram shows an irregular mottling which may be due to the formation of numerous suppurative foci but may on the other hand be due to an irregular resolution. Only the course of the disease permits their differentiation. Similarly simple resolving lobar pneumonia simulates the irregular mottling produced by suppurative foci and cannot ordinarily be differentiated from it roentgenologically.

Repeated roentgen examinations may reveal abscess formation which may be solitary or multiple. The single non putrid abscess is uncommon.

The presence of pulmonary cavitation is not in compatible with complete spontaneous resolution although recovery may be slow. The clinical condition of the patient is a much better guide to prognosis than the roentgen appearance.

Roentgenologically the presence of an abscess is definitely indicated only by a fluid level. The absence of a level does not however exclude the possibility of an abscess.

Roentgenological signs of atelectasis often appear relatively early in the disease and are due to bronchial obstruction as a result of plugging by thick tenacious secretions. Persistence of the atelectasis is the result of shrinkage due to maintenance of this contracted state by an interstitial fibrosis. The affected lobe may appear to be homogeneously consolidated and may simulate lobar pneumonia.

Pleural involvement may take the form of simple effusion, general empyema, encapsulated empyema or encapsulated or general pyopneumothorax.

Loculated pyothorax with or without a fluid level due to the presence of air is common. Loculation may occur anywhere within the pleural cavity. Intrapulmonary and paramediastinal collections prevent the most difficulties in diagnosis.

It is often not possible to state whether a cavity is pulmonary or pleural. The large cavities are often intrapulmonary while the small fluid levels may represent pleural loculation.

Even after adequate drainage of a pulmonary or pleural collection of pus a similar bronchopneumonia may develop elsewhere in the lungs with its own set of complications.

Bronchial dilatation: a common accompaniment of suppurative bronchopneumonia. It develops early but is not necessarily permanent.

The disease in children is essentially the same as in adults although usually more extensive. Obstructive emphysema and atelectasis are apt to be prominent features in infants.

A complete roentgenological examination including roentgenocopy and roentgenography in sagittal, oblique and lateral views is essential for the diagnosis and localization of pulmonary suppurative disease.

J. DANIEL WILLEMS, M.D.

Santy P. and Bérard M. Total Pneumonectomy for Bronchiectasis (*Pneumonectomie totale post bronchiectasie*). *Presse Méd. Iar* 1935 45 823.

Santy and Bérard report a case of extensive bronchiectasis of the left lung in a child of ten years cured by total pneumonectomy. They state that this is the first French case to be published. Due credit is given to the foreign surgeons who have made earlier reports.

The authors believe that total pneumonectomy is definitely indicated in the treatment of extensive bronchiectasis that the technique is well established and that the results are daily more encouraging. They emphasize the different problems to be faced in the performance of pneumonectomy for cancer and for bronchiectasis.

The case reported was that of a ten-year-old girl who had been well up until the age of five. At that time in 1931 she had an acute pulmonary episode characterized by cough and expectoration. The roentgenogram showed haziness of the entire left chest with a denser mass in the hilum. After a stay of five months in a preventorium her symptoms disappeared and her general health improved. In February 1935 she had a return of the symptoms with frequent coughing and expectoration of fetid material and gave evidence of a loss of appetite and weight. Examinations revealed signs of bronchiectasis involving the entire left lung. The mediastinum was found to be retracted to that side. Postural drainage very rapidly diminished the foulness of the sputum and she was then sent to the mountains for the winter and spring. While she was away her general condition was considerably improved. She gained weight and the sputum almost entirely disappeared. On her return she was afebrile and it was thought that her condition warranted surgical intervention.

The operative pneumothorax was started on June 21, 1937 and was easily induced. The second insufflation caused copious expectoration. The third and last was given two days before the operation and the intrapleural pressure was left at zero. The roentgenogram showed a separation of the greater part of the lung from the chest wall.

Operation was carried out on July 5, 1937 by Santy, Bonniot and Bérard. Rectal anesthesia was used supplemented with Schleisch's drops (chloroform and ether) from time to time. Oxygen in

halation was frequently used during the operation. An incision throughout the length of the sixth interspace was made with posterior division of the sixth and seventh ribs. The opening of the thorax was well tolerated. There were a number of adhesions which made complete separation of the lung and freeing of the hilum difficult. The fine silk tourniquet of Nelson was applied and the pleural cavity protected from soiling by means of large packs of gauze soaked in acriflavine solution. When the hilum was cut across, constant suction removed the escaping secretions. After the hilar stump had been oversewn with chromic catgut, the tourniquet was released and its silk cord was tied snugly about the stump. A second silk ligature was also applied. After a large Monod drain had been inserted into the axillary region through the eighth interspace, the chest wall was completely closed.

Immediately after the operation the child was kept in the head-down position. Convalescence was uneventful. The drainage tube was opened on the second day to allow the escape of 200 c cm of nearly pure blood. It was opened again the next day and then kept closed until the sixth day. It was removed on the fifteenth day and the tract closed almost at once. The patient was allowed to get up on the eighteenth day.

Examination of the resected lung showed it to be smaller than normal. On section the parenchyma was found to be profoundly changed, as it was excavated by numerous cavities with fibrous walls representing cross sections of greatly dilated and changed bronchi encircled by marked peribronchial sclerosis. The cavities were practically dry and without any purulent exudate.

When seen three months after the operation the patient was functionally entirely well. The clubbing of her fingers had even disappeared to a great extent. The obliteration of her left pleural space had been followed up by means of roentgenograms taken every ten days. There had been a gradual elevation of the diaphragm, displacement of the heart and mediastinum to the left, and progressive thickening of the pleura. By the end of the second month only a small clear zone the size of a thumb was seen in the left chest.

With regard to the pre-operative treatment of the patient, the authors believe that it is extremely important to get the exudative phenomena under control. A sojourn in a suitable climate and carefully executed postural drainage are the chief agents. Postural drainage must be faithfully used to be effective, but the authors consider it far preferable to the usual type of bronchoscopic drainage. When it is felt that the patient is ready for operation artificial pneumothorax is induced for a few days or a week before the operation. The last refill should be given no later than two days before the operation and the pressure should be left very slightly positive. The authors believe the pulmonary collapse aids in emptying the bronchiectatic cavities, allows the body to become adjusted to the new conditions to

be created by the pneumonectomy, and makes the thoracotomy more readily tolerated.

The authors feel that intratracheal positive-pressure anesthesia is not ideal because of the suppression of the cough reflex and the danger of pulmonary trauma from the positive pressure. They believe that local and spinal anesthesia are becoming increasingly popular, although in their case they used rectal anesthesia because of the child's age.

In regard to the operative technique they follow the Brunn-Shenstone procedure, but in addition they use the tourniquet cord for ligation of the oversewn hilar stump as suggested by Overholt. They emphasize the importance of walling off the hilum with antiseptic pads during its division.

In conclusion, the authors point to the progressive improvement in the mortality rate from pneumonectomy and give the latest figures of Edwards' personal series of pneumonectomy for bronchiectasis. He has performed 22 pneumonectomies with only 2 deaths, and these deaths were due to cerebral complications.

RICHARD H. MEADE, JR., M.D.

ESOPHAGUS AND MEDIASTINUM

Adams, W. E., and Phemister, D. B.: Carcinoma of the Lower Thoracic Esophagus. *J. Thoracic Surg.*, 1938, 7: 621.

The authors discuss all of the cases of resection of the thoracic esophagus for carcinoma found in the literature and add the report of a case.

A woman, fifty-three years old, had difficulty in swallowing, and suffered from weakness and loss of weight for three months. She also had a "stick down near the stomach" when taking food, and a "lump which would go no farther." Examination showed a secondary anemia. X-ray examination following the ingestion of barium revealed an abrupt narrowing of the esophagus about 6 cm. above the cardia, but no dilatation. The patient received a pre-operative blood transfusion, as well as saline and 5 per cent dextrose solutions intravenously and alternately. She was kept on a high caloric diet for four days. Resection of 3 in. of the lower end of the esophagus and 1 in. of the cardiac portion of the stomach was accomplished and an end-to-side anastomosis performed. A gastrostomy with a mushroom catheter was made, the catheter being brought out through a stab wound of the abdominal wall. The patient made an excellent recovery and seventeen days after operation was able to take food by mouth.

One month after operation x-ray examination after the ingestion of barium showed an unobstructed passage through the anastomosis.

J. DANIEL WILLEMS, M.D.

Adams, W. E., Escudero, L., Aronsohn, H. G., and Shaw, M. M.: Resection of the Thoracic Esophagus. *J. Thoracic Surg.*, 1938, 7: 605.

These authors report upon their experimental work on dogs. Resection of as much as 4 in. of the thoracic esophagus with gastro-esophagostomy was

successfully performed in a relatively high percentage of animals. Leaks of the anastomosis developed in only 4 of a series of 13 dogs and only where a cutting needle was employed during the operation. Seven dogs functioned well after the operation and the remaining 2 died of postoperative pneumonia.

Other dogs were operated upon with variations in technique and the authors arrived at the following conclusions:

Tension on the suture line of the anastomosis is one of the major causes of failure to hold.

Postoperative mediastinitis and pleuritis due to contamination at operation can be decreased by careful walling off of the field of anastomosis and by the use of an end to side rather than an end to end union, whether or not a portion of the cardia is resected. This is made between the upper cut end of the esophagus and the fundus of the stomach.

Interrupted linen sutures in two layers are the best and no stenosis results from their use. In 2 cases with continuous sutures a great deal of stenosis followed.

Trauma of the vagus nerve should be avoided during mobilization of the esophagus in order to lessen postoperative vomiting. Mobilization should include only that portion of the esophagus which is to be resected because the blood supply is easily disturbed and this disturbance may lead to necrosis of the cut end of the esophagus or to leakage at the anastomosis.

A two stage resection of the lower thoracic esophagus with reunion of the esophagus and the stomach may be advised for some patients but in the experiments of these authors less esophagus could be safely resected when the two stage operation was used. The granulation tissue and adhesions reduced greatly the pliability of the tissues.

Resection of all or a part of the thoracic esophagus without reestablishment of the continuity of the alimentary tract was not well tolerated in these experimental animals. High resections were more successful than low ones because of less peristaltic action on the upper esophageal stump.

J. DANIEL WILLEMS, M.D.

Meyer, L. A. Anterior Suppurative Mediastinitis.
Estnisk Akir 1938 55 139.

The author studied the topographical anatomical conditions of the anterior mediastinum on 9 cadavers by the following methods: (1) dissection of the interpleural space without any preliminary in-

jection (2) injection of hardening masses through the sternum into the tissue of the anterior mediastinum with a following dissection (3) roentgenography of the thorax after preliminary injections of contrast medium into the anterior mediastinum and (4) sections of the frozen thorax at various levels. The studies were made to investigate the paths of spreading infection and to establish the best approach to the mediastinum.

Usually the mediastinitis originates from an inflammation of the lymph nodes surrounding the internal mammary artery or pharynx or located within the mediastinum. Furthermore metastatic abscesses of the mediastinum may develop after thyroidectomy. Mediastinitis may also follow infected wounds, contusions or fractures of the sternal regions or the process may spread from pulmonary abscesses, purulent pleurisy, tuberculosis or acute osteomyelitis of the sternum.

A primary anterior suppurative mediastinitis is extremely rare.

Pain, fever, respiratory embarrassment, cough and a sensation of oppression are the most characteristic symptoms of mediastinitis. The pain is usually localized behind the sternum and may radiate to the spine or the interscapular region. The sternum may be sensitive to pressure. Unless death ensues the pus may find its way to the intercostal space or it may choose more complicated paths. A perforation into the pleural cavity is rare because of the reactive thickening of the pleural membranes. On the other hand, even if the pus does not enter the pleural cavity, a reactive exudative pleurisy may develop. A perforation of the trachea, esophagus or pericardium has been described.

The acute process may become chronic or the mediastinitis may have an insidious onset.

A differential diagnosis must be made from pericarditis, myocarditis or pneumonia.

The prognosis of the anterior mediastinitis is very serious as septicemia or other dangerous complications very frequently develop.

Wide exposure of the anterior mediastinum and drainage of all abscess cavities make up the treatment of choice. The following methods have been suggested: approach from the suprasternal notch, resection of the clavicle, transsternal approach with temporary or definite resection, trepanation of the sternum and rib resection.

The author operated on 4 cases of acute suppurative anterior mediastinitis with a recovery.

JOSEPH E. NARAT, M.D.

CARCINOMA OF THE STOMACH

Collective Review

FREDERICK CHRISTOPHER, B S, M D, F A C S, Evanston, Illinois

DESPITE the hundred or more articles on cancer of the stomach which have appeared annually in the past few years, that disease remains a challenge to the medical profession and to the public. It is still the "unsolved problem." The subject is worthy of repeated examination and study because of its frequent occurrence and its curability in the early stages. Earlier diagnosis and improved surgical treatment will go far to lower the death rate and to diminish the suffering caused by this disease. The public and even a large part of the medical profession are unaware of the great help that surgery can give to the people suffering from this disease.

Cancer is second among diseases as the cause of death, and in 1936 the rate was 111.0 per 100,000 population. The leading importance of cancer of the stomach as a cause of death may be seen from the following table.

TABLE I — CANCER MORTALITY IN THE UNITED STATES, 1936
(U S Public Health Reports)

| | |
|--|---------|
| Total deaths from cancer | 142,613 |
| Cancer of stomach and duodenum (practically all stomach, 19 per cent of total deaths) (male, 16,210, female, 11,031) | 27,241 |
| Cancer of the uterus | 16,280 |
| Cancer of the intestines (except duodenum, rectum, and anus, nearly all large bowel) | 15,364 |
| Cancer of the breast | 13,708 |
| Cancer of the liver and bile passages | 10,425 |
| Cancer of the rectum and anus | 7,325 |
| Cancer of the prostate | 7,140 |
| (Other organs in diminishing frequency) | |
| (Estimated annual death rate from carcinoma of the stomach, 38,000) | |
| (Mortality, carcinoma of stomach, 21.1 per 100,000 population, on basis of 27,000 annual deaths) | |

The estimates of various authors as to the annual mortality from cancer of the stomach in the United States are somewhat at variance with the statistics of the Bureau of Census. Horsley (72) estimates 35,000 and Collins 38,000. Pack (124) believes that 35 per cent of all deaths from cancer are due to gastric carcinoma. Morley states that the 1934 mortality from cancer of the

stomach in England and Wales was 12,269. Burgess believes that gastric cancer causes about one-third of all the deaths from cancer in England. Cancer in general is said to be more common in the poorer classes (Stout), and curiously enough its death rate is three times as common in Massachusetts as in Arkansas.

The simplest classification of cancer of the stomach is that of Stout who divides the majority of cases into the ulcerating types which have crater formation and the vegetating types which include not only the protruding polypoid types, but the diffuse infiltrative types. Bastianelli (18) has described a cancer arising from the subserous layer of the stomach and duodenum which he terms "carcinoma perigastroduodenale." The cancer of the stomach known as "linitis plastica" or leather-bottle stomach is defined by David (43) as a "thickening of the stomach wall which converts the stomach into a rigid inelastic tube, frequently accompanied by stenosis of the pylorus." Colloid carcinoma of the stomach makes up about 5 per cent of the cases of gastric cancer (Stinson). Gastric polyposis is uncommon, but is considered by Chamberlin (31) to have "grim potentialities as a precursor of carcinoma" and should be removed at once. Brunn and Pearl found malignant degeneration in about 12 per cent of 84 collected cases of diffuse gastric polyposis. A case of malignant diffuse gastric polyposis with successful subtotal gastric resection was reported by Christopher (32) in 1937. Miller, Eliason, and Wright (116) studied 23 cases of gastric polyps and found malignancy in 8 of them. In Benedict and Allen's (21) series of 17 cases of gastric polyp, 7 (41.2 per cent) were malignant. All gastric polyps when demonstrated should be subjected to as radical surgical treatment as a known carcinoma. Simultaneous carcinoma of the stomach and colon has been reported by Sussman and by Pemberton and Waugh, who refer to the study of Warren and Gates of 1,259 cases of multiple primary cancer and found the stomach and colon to be involved together in 30 cases. The association of purpura and carcinoma of the stomach has been reported by Stebbins and Carns and by Stillman (2 cases). Fennel reports a Krukenberg tumor (of the ovary) which he thinks may have

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resulted from a carcinoma of the stomach. Combined carcinoma and tuberculosis of the stomach has been reported by Sprunt who cites 13 cases.

According to Ewing (51) the United States Census of 1914 enumerated 11 733 cases of carcinoma of the stomach. Among these 10 436 of the patients were between the ages of forty and eighty with the largest group (3 587) between sixty and seventy years of age. In Stout's series the greatest number of patients were between the ages of fifty and sixty. Lahey (93) found 54 per cent of 168 patients with carcinoma of the stomach to be between the ages of forty and fifty-nine years and 35 per cent between sixty and seventy years. The average age of Marshall and Taylor's (109) series of 291 patients was fifty-five years with the lower and upper limits nineteen and eighty-two years respectively. Thirty-six per cent of 1 000 patients reported upon by Eusterman were between the ages of fifty and fifty-nine years. 36.7 per cent of 120 patients reported upon by Oughterson were between sixty and seventy years and 28.3 between fifty and sixty years. Recently Marble reported carcinoma of the stomach in a seventeen-year-old girl and King reported it in a twenty-year-old negro.

Warwick studied 176 autopsies in cases of carcinoma of the stomach. In 42 per cent the pylorus was involved in 37 per cent the wall in 11 per cent the cardia and in 10 per cent the lesion was diffuse throughout the wall. She states ulceration was present in 43 per cent and of these 31 per cent showed perforation which was plugged in 16 per cent and open causing fatal peritonitis in 35 per cent. Obstruction was present in 34 per cent at the pylorus in 72 per cent and at the cardia in 28 per cent. Metastases were found to the liver, regional lymph nodes, peritoneum, omentum, lungs, mesentery and bronchial lymph nodes. In 3 per cent of the cases metastases were absent. Carcinoma of the stomach with cerebral metastases have been reported by Eusterman and Wilbur (50). Crisp and Miller describe a case of cancer of the stomach with skin metastases and state there are 137 such reported cases. Metastases to the bones and lungs are rare according to Moore. Metastases also occur to the cervical lymph nodes (Virchow's gland) and to lymphatics of the cul de sac of Douglas. In 77 per cent of Stout's cases the pylorus or lesser curvature or both was involved. In 60 per cent of Collins' cases the pyloric third of the stomach was involved.

Undoubtedly a certain number of cancers of the stomach start in an old gastric ulcer but Stout confesses that it is impossible with our

present knowledge to know what proportion of chronic stomach ulcers become cancerous. The proportion is probably small. Ewing (52) says that the presence of islands of cancer in the edges of an ulcer is no indication that the cancer is the sequel of the ulcer. The cancer may actually excavate itself. It may closely simulate an ulcer (Stout). Ewing points out that there may be multiple areas of early carcinoma of the stomach. Miller (115) believes that chronic gastritis with a decrease or absence of hydrochloric acid and sometimes with the presence of mucus usually precedes carcinoma of the stomach and may be an etiological factor. Hindhede asserts that man is the only mammal with cancer of the stomach and observes that in Denmark where the eating of meat is prevalent cancer of the stomach comprises 60 per cent of all cases of cancer whereas among the plant eaters of India only 4 per cent of all cancers are cancer of the stomach.

Of vital importance are careful studies of the early symptoms of cancer of the stomach for it is only through early diagnosis that curative surgical treatment may be carried out. As Collins observes the diagnosis must be made when the patient appears normal. There is no tumor palpable, there is no reduction in the erythrocyte count or hemoglobin and no weight loss. When the classical picture of weight loss, vomiting and palpable tumor is present it is often too late to effect curative surgical treatment. Forty-one and seven tenths per cent of Oughterson's patients were admitted to the hospital within six months after the onset of symptoms. As Balfour (8) says

there is no characteristic syndrome of carcinoma of the stomach. The symptoms may be characteristic of many other gastro-intestinal lesions (Jordan and Hill 78). Of 3 000 patients complaining of gastric symptoms at the Mason Clinic 3.6 per cent had carcinoma of the stomach (Dwyer, Blackford and Turner). Carcinoma of the stomach may have symptoms of an ulcer of long or short duration (Wilbur 1,0) or it may produce attacks of pain indistinguishable from those of cholelithiasis (Weiner). Alvarez (1) studied 41 consecutive case histories of physicians having carcinoma of the stomach and found them to be just about as guilty of procrastination as the laity. He believes that every suddenly appearing disturbance of digestion appearing at middle age or beyond should be suspected gravely. Jordan (77) points out that a change of the symptoms in an old history is important in the diagnosis of malignancy. Eusterman (48) emphasizes the likelihood of malignant disease in the presence of a previously known gastric lesion if there is a dis-

appearance of symptoms with the substitution of a continuous or remittent clinical course. He notes also that in gastric carcinoma food tends to aggravate the pain rather than to ease it. Lahey (93) considers a gastric lesion to be an ulcer when, after from two to three weeks of bed rest, the patients lose all symptoms, the occult blood disappears from the stools, the lesion disappears in the x-ray, and the peristaltic waves pass flexibly through the healed area.

"A little indigestion" in any patient over thirty years should be regarded seriously. Moynihan has said that the "success of the medical treatment in early cases of carcinoma of the stomach is one of the causes of the high mortality of the disease." Weir and Johnson (167) regard with suspicion the abrupt onset of symptoms in a patient previously well and also the ulcer type of dyspepsia which may respond to treatment. Goldie says, "suspect carcinoma in every individual of forty years or over who has any form of gastric disturbance, until you can prove that the cause is not carcinoma." In his careful analysis of the early symptoms of carcinoma of the stomach, Harris lists the following in order of importance: (1) gradually increasing loss of appetite, (2) epigastric distress (recently developed stomach consciousness), (3) indefinite abdominal pain, (4) a history of gastric ulcer with a change of symptoms, (5) general malaise, (6) a family history of carcinoma, (7) a little loss of weight, (8) fatigability, and (9) unexplained anemia. Lahey and Taylor (109) list the symptoms in approximate order as: (1) indigestion, (2) anorexia, (3) pain, (4) vomiting, (5) weight loss, (6) constipation, (7) dysphagia, (8) hemorrhage, (9) mass, (10) tarry stool, and (11) anemia. The symptoms in order of appearance are listed by Spriggs as: (1) discomfort, fullness, or pain in the abdomen not related to food, not severe but recurring persistently, (2) loss of appetite with nausea, (3) pain or discomfort after food, (4) "heart burn" and eructation, (5) flatulence, and (6) vomiting. Collins emphasizes loss of appetite. Levitt and Argue studied the symptoms of 132 patients with carcinoma of the stomach at the Buffalo City Hospital and found the most common to be: loss of weight, in 87.1 per cent, epigastric pain, in 71.9 per cent, vomiting, in 69.9 per cent, flatulence and anorexia, in 58.3 per cent, constipation, in 36.3 per cent, weakness, in 25.7 per cent, and tarry stools, in 19.0 per cent. Virchow's node was found 4 times in their 132 cases. Lahey (93) found a mass in 31 per cent of his operable cases, and 54 per cent of his inoperable cases.

In carcinoma of the cardiac end of the stomach the signs are largely esophageal and are related to deglutition (Kiefer, 83). Kiefer studied 28 cases of this type and found them to be slow in giving rise to gastric symptoms while marked systemic symptoms were developing. Dysphagia is a frequent symptom of carcinoma of the cardiac end of the stomach (37, 122). The pyloric carcinomas, which constitute the majority, eventually produce obstruction. In the fundus (pars media) the carcinoma may produce no symptoms at all. The pain of carcinoma at the pylorus is more likely to be epigastric and carcinoma of the lesser curvature frequently causes interscapular pain (Streicher). Symptoms of intermittent obstruction or regurgitation after solid food in the presence of gastric achlorhydria should give rise to the suspicion of gastric polyposis (31).

After the symptoms have aroused the suspicion of the possibility of a carcinoma of the stomach, the cornerstone of the diagnosis is the roentgenogram. Lahey (95) urges that we make more x-ray films of every patient past forty-five years who has indigestion which has existed unrelieved even though not treated more than a week. In the well developed case of cancer of the stomach, according to Cole, the diagnosis is easier than that of fractures. Rigler considers the x-ray examination of the stomach to be one of the most accurate procedures in medicine. Gastric lesions as small as from 1 to 1.5 cm. can be detected by a competent roentgenologist (160). However, the early x-ray diagnosis, like the clinical, is a matter of greatest difficulty. Cole believes that a few cancer cells in the stomach wall can cause a "limp in gastric peristalsis," and that a diagnosis based on this finding may be more accurate than one based on the gross appearance of the tumor. By making multiple films in rapid succession (serial roentgenography) Cole is able to demonstrate the absence of peristalsis or abnormal peristalsis due to lack of pliability of the gastric wall caused by infiltration of the submucosa by cancer cells. Ewing (52) has pointed out that from the pathologist's standpoint obliteration of the rugæ or fixation of the mucosa probably constitute early criteria for carcinoma of the stomach. Cross calls attention not only to disturbance of peristalsis, but to changes in the mucosal patterns. Jordan (77) recommends palpation of the stomach in which there is a small amount of barium, in this way the thinner, flatter rugæ of carcinoma may be disclosed. She warns that the adhesions of a healed ulcer, omental pull, and spasm may be confusing, and maintains that the size of the lesion is of no diagnostic value. Jordan says that

all real lesions of the greater curvature are malignant a statement concurred in by Lahey (95). Most ulcers occur in the media of the lesser curvature and most carcinomas in the distal third (with important exceptions). Lahey (93) observes that extensive lesions can exist with relatively few symptoms and that not all prepyloric lesions are malignant. Rehfuess in discussing the x ray diagnosis of carcinoma of the stomach emphasizes (1) fluoroscopy in the lateral as well as anteroposterior positions (2) examination in the recumbent position (3) a suspicious attitude toward negative defects (even though they resemble healed ulcers) and (4) repeated reraying of healed ulcers. Kantor warns against the simulation of carcinoma of the stomach by the giant rugæ of localized hypertrophic gastritis. On the basis of coincident lesions of the colon and stomach Sussman on finding multiple constrictions of the colon looks for a lesion in the stomach. Carcinomas of the cardia are easily missed (83). Roentgenography plays a leading part in the diagnosis of carcinoma of the stomach but as Moore says its rôle in determining the operability of a given case is not brilliant. Four hundred cases which had been operated upon at the Mayo Clinic were studied and it was found that in more than half which proved to be inoperable after exploration there had been no such classification following roentgenography. Moreover 39 of these cases which had been classed as inoperable after roentgenography were operable. Bloodgood (22) warned that it was dangerous to conclude through x ray examination only that any lesion of the stomach is cancer and is inoperable. In 58 of McVicar and Daly's (112) cases resection was possible in spite of x ray evidence of inoperability. These authors report 507 cases of carcinoma of the stomach in which resection was done in 30 per cent of these expert roentgenologists were unable to say definitely that the lesion was malignant. Marshall and Taylor (109) state that any bowel symptoms call for an x ray examination of the stomach as well as of the balance of the gastro intestinal tract. For excellent articles on the x ray diagnosis of carcinoma of the stomach see Kirklin and Eusterman (187), Stewart and Illick, Hammer and Case.

Achlorhydria is of no value in the early diagnosis of gastric carcinoma; there may even be a hyperchlorhydria (66). Seventy per cent of Marshall and Taylor's (109) cases showed achlorhydria but these authors also point out that normal or excessive hydrochloric acid does not exclude carcinoma. Jordan (77) points out that diminution of the acidity in cases of gastric ulcer sug-

gests malignant change (see also Comfort and Butsch 38 and Comfort and Vanzant 39). The presence of free or occult blood in the stomach or of occult blood in the feces is an important finding. Meulengracht and Jensen however report 66 cases of carcinoma of the stomach in 6 of which occult blood was absent. It is important that the tests for occult blood be carefully controlled by a diet free from meat.

The anemia of carcinoma of the stomach may be very difficult to distinguish from pernicious anemia (Melland) and moreover these two diseases may coexist (Conner and Birkeland). Macht (102a) has worked out a blood test which he says makes a decisive distinction between pernicious anemia and the anemia of carcinoma of the stomach. The test is the determination of the phytoxic index which in pernicious anemia is 44 per cent and in cancer 70 per cent. Hartman and Brockbank from studies of the blood in cases of carcinoma of the stomach are of the opinion that a hemoglobin below 40 per cent is not in itself sufficient reason for a surgeon not to explore. Curiously enough the x ray findings in the stomach in cases of pernicious anemia may closely resemble carcinoma. The serological test of Grushkin for malignancy is thought by Pratt to have some value in the diagnosis of carcinoma of the stomach. The Wolf-Schindler flexible gastroscope has been helpful at the Massachusetts General Hospital in the diagnosis of carcinoma of the stomach (Benedict 20). For a comprehensive account of this instrument see Schindler (141) who admits that negative findings are not entirely conclusive.

Jekel reports a case of carcinoma of the stomach in which the diagnosis was made from a fragment of the tumor obtained through a small nasal tube. David (44) in discussing the diagnosis of carcinoma of the stomach calls attention to the danger of confusion with (1) foreign bodies in the stomach (as hair balls, food balls, shellac balls) (2) chronic granulomas (Hodgkin's disease, leucemia, lymphosarcoma) (3) syphilis or tuberculosis (4) sarcoma and (5) benign tumors (myoma, adenoma, papilloma, hemangioma and inflammatory fibromatosis). Klotz describes a granuloma of the stomach in which the pre-operative diagnosis was cancer and in which diagnosis was difficult at operation.

According to the San Francisco Cancer Survey as quoted by Ashhurst and Kloppe the average duration of life in carcinoma of the stomach from the onset of the first symptoms is fifteen and seven tenths months. Minnes and Geschickter seemed to be justified in their statement that

early carcinoma of the stomach is curable by surgery Alvarez (1) says the cure of carcinoma of the stomach is accomplished by excising it during the stage when it looks and behaves like a benign ulcer. If the clinical findings are suggestive, Harris advises abdominal exploration in suspicious cases even if the x-ray findings are negative. Balfour (9) says "a good rule is that all patients (in whom the diagnosis of cancer of the stomach has been made) whose condition obviously is not incurable should be subjected to exploration." He says that distant metastases, extensive local disease, and rarely the general condition of the patient may be contraindications to operation. Walters (158) believes that the presence of metastases in the cervical lymph nodes, umbilical lymph nodes, or pelvic implants (rectal examination of cul-de-sac, in the lithotomy or knee-chest position) generally contraindicate operation, but that a metastatic node in the liver is no barrier to radical operation if the patient is in good condition. Bloodgood (22) considered the positive signs of a hopeless carcinoma of the stomach to be peritoneal exudate, skin nodules in the abdominal wall, or an enlarged nodule of the liver. Marshall (107) explored all cases of carcinoma of the stomach unless there is definite evidence of widespread metastases. He believes the finding of liver metastases, multiple tumors, or abdominal fluid precludes resection. In some cases resection should be carried out even if there are metastases in the liver (93). Painless metastatic invasion of the liver is the most common factor responsible for death (in resected cases) (Balfour, 16). Alvarez (2) cites a case to show that a lesion of low malignancy may grow at least three years without becoming inoperable. Gray (61) studied 273 cases of resection of the stomach for malignancy in which the patients lived five years or longer. One hundred and forty-five patients lived from five to ten years after the operation and 128 lived ten or more years. From his study of these cases, Gray concluded that "from a clinical standpoint sex, age, familial history of malignancy and the general condition of the patient as evidenced by loss of weight, value for hemoglobin, and gastric retention are inconclusive so far as prognosis is concerned. A short history is a grave prognostic omen, and the presence of anacidity must be considered with added apprehension." Judd and Phillips (80) believed that patients who have carcinoma of the stomach with long-standing symptoms have the best chance for a cure. They add "if secondary lesions have occurred, it is possible that their progress will be held in check following

removal of the primary growth." Judd and Waldron (81) believe operation is often justifiable in cases of carcinoma of the stomach with extensive regional lymphatic involvement, and cite the case of a man sixty-four years of age at the time of a partial gastrectomy who was living and well eleven years after. They say, "removal of the primary growth together with adjacent involved lymphatic structures, at times seems to have considerable influence on the course of distant lesions."

radical removal of this extensive active malignant process gave the patient the assistance needed for control of the disease." Holman says resection of the stomach is indicated in any ulcer elsewhere than the lesser curvature and in ulcers of the lesser curvature and pyloric region which fail to regress after several months of strict dietary regimen. (See Whipple and Raiford for discussion of the type and grade of gastric carcinoma in relation to operability and prognosis.) In a study of the operability of carcinoma of the stomach Hunt says, "a study of statistical material reveals a wide variation of operability which in many instances is based not only on removability of the growth, but also on palliative surgical procedures. Quoting from several authors, acceptance for surgical procedures in various hospitals has varied from as low as 30 per cent to 70 per cent of all cases of carcinoma of the stomach [Maes, Boyce and McFetridge (104), 30 per cent, Gatewood (55, 56), 50 per cent, Balfour (10), 50 per cent, St. John (147), 67 per cent, and Lahey (90), 70 per cent]. A similar wide variation exists in regard to operability in terms of resection or removal of the growth, which was done in from 16 to 47 per cent of the cases in which surgical exploration was carried out [St. John (147), 16.4 per cent, Maes, Boyce, and McFetridge (104), 17.0 per cent, Gatewood (55, 56), 43 per cent, and Lahey, 47 per cent]. Hunt performed resection in 36.2 per cent of 149 cases of carcinoma of the stomach which were explored. In 1935 Lahey, Swinton, and Peelen (96) regarded 25.7 per cent of their cases of carcinoma of the stomach as operable. In a later paper, Lahey (95) states that his operability of carcinoma of the stomach (presumably the percentage of explored cases which were resected) was 22 per cent (with five-year cures in 7 per cent). He contrasts this with the 74 per cent operability of carcinoma of the colon (with five-year cures in 42 per cent). Walters (159) reported 3 successful gastrectomies which were performed for carcinoma of the stomach in which abdominal exploration had been done elsewhere and the lesion had been pronounced inoperable.

The operative mortality for gastric resection is extremely variable in different clinics. Von Haberer points out that the resection mortality of carcinoma of the stomach is higher than that of ulcer of the stomach. The best record by far is that of Balfour (10) who reported 200 gastric resections with death occurring in the hospital in only 5 per cent. Other series give an operative mortality of from 30 to 40 per cent. Marshall and Taylor (109) report 8 complete gastrectomies with a 50 per cent mortality and 68 subtotal gastrectomies with a 31 per cent mortality. Balfour (15) reports the following hospital mortality in 4791 operations for carcinoma of the stomach at the Mayo Clinic from 1906 to 1931 inclusive: 2112 partial gastrectomies with a mortality of 13.9 per cent; 833 gastro-enterostomies with a mortality of 11.5 per cent and 1,848 explorations with a mortality of 3.5 per cent. In the series of Maes, Boyce and McFetridge (104) the mortality in 35 resections was 51.4 per cent. The mortality in St. John's (147) series was 41.7 per cent and in Oughterson's 52.6 per cent. Finsterer reported mortality of 19.4 per cent in 340 cases. Of these 11 were simple resections with a mortality of but 6.1 per cent. Lewisohn and Mage are undoubtedly correct in saying that no attempt should be made to keep the operative mortality for gastric carcinoma at a low level by refusing to subject patients to radical resection who are at the borderline of operability. Advanced age need not be a barrier to extensive operation (74).

Horsley (73) believes that the danger of infection in gastric resection is diminished by the employment of daily lavage with dilute hydrochloric acid for a few days before operation. This plan is also followed at the Lahey Clinic (108). The stomach should be empty at the time of operation. Great care must be observed to minimize or prevent spillage of or contamination by gastric or duodenal contents. It is important not to traumatize the pancreas if possible. On exploration if the tumor is fixed it is generally inoperable (107). It must be remembered however that fixation to the pancreas may be inflammatory. Lahey (94) says there is no operation in abdominal surgery in which failure can more often result from the omission of small technical details than in gastric resection. He uses fine silk ligatures in the management of pancreatic bleeding and for the duodenal stump. He believes it important to use interrupted silk mattress sutures in the external layers in a resection. In a total gastrectomy the left lobe of the liver is detached from the diaphragm. When a posterior resection is done the rent in the mesentery is sutured to the

stomach. He uses cellophane gauze drapes (91). Balfour (12) emphasizes the importance of good hemostasis. He uses chromic catgut for the inner row or rows and silk or linen for the seromuscular sutures. In cases in which slow healing is expected permanent suture material is used throughout. There should be no tension on the suture line, no folds in the stomach and the anastomosis should be in healthy tissue. The glands at the lesser curvature are more difficult to remove than those of the greater curvature and those behind the pylorus may cause trouble. Large glands may be inflammatory rather than malignant. It may be necessary to remove the entire omentum and part of the transverse colon (107).

The types of operations for carcinoma of the stomach are classified by Horsley (73) into curative and palliative procedures. The former include the Billroth I and Billroth II types of operations and total gastrectomy. The latter includes gastro-enterostomy, exclusion types of operation (Devine) and gastrostomy. At the Lahey Clinic the Hoffmeister modification of the Polya operation with a long antecolic loop of jejunum as suggested by Balfour is most commonly used. In this operation the proximal stomach stump is closed down to a small stoma at the greater curvature where the anastomosis to the jejunum is made. The jejunum proximal to the anastomosis is sutured to the turned-in portion of the stomach. Walters (156) uses a left rectus incision for all extensive gastric operations. Marshall (107, 109) of the Lahey Clinic gives a number of technical suggestions. The gastrocolic omentum is divided and ligated well beyond the tumor and the pylorus. Great care is exercised to avoid the middle colic artery which is vulnerable as the mesocolon is partially fused with the gastrocolic omentum. The lesser peritoneal cavity is opened if necessary to determine whether or not the growth has extended to the pancreas or whether or not the glandular involvement about the celiac axis is too extensive for removal. The right gastric artery is ligated and the duodenum mobilized. The duodenum is divided from 3 to 4 cm. beyond the pylorus and inverted by catgut reinforced by silk. The stomach is turned to the left to expose the celiac axis. The left gastric artery is ligated at its origin on the celiac axis. The glands are removed and the borders of the stomach are thoroughly cleaned. The de Petz clamp is used on the stomach. (This clamp is well described by Pack and Scharnagel (12).) A loop of jejunum from 20 to 25 cm. in length is used and either the proximal or the distal loop of jejunum may be placed at the greater curvature.

The stoma should be 3 fingers in width. The anastomosis may pass through the transverse mesocolon, but there is less risk if the jejunum passes in front of the colon as suggested by Balfour who in addition does an entero-enterostomy. The antecolic gastro-jejunostomy is preferred at the Lahey Clinic. Bloodgood (23) urged more frequent use of the Billroth I operation. In two years at the Lahey Clinic, Cattell and Colcock report that the Billroth I operation was used 9 times and the Hoffmeister-Polya 71 times. The Billroth I is favored in elderly poor-risk patients with a carcinoma in the prepyloric area and when approximation is easy. Walters, Priestley, and Gray (162) favor the Billroth I method in elderly patients in whom the first and second portions of the duodenum can be mobilized easily, and consider it less formidable than a Polya. They report 50 cases. Castleman studied 21 cases of carcinoma of the pyloric end of the stomach at the Massachusetts General Hospital, in which there was extension of the tumor into the duodenum of from 4 to 23 mm. Verbruggen's studies caused him to recommend that in excision of an ulcerating carcinoma one should go at least 4 cm beyond the ulcer, in diffuse lesions it will be impossible to tell how far to go.

In regard to total gastrectomy, Balfour (13) says that the most important single point in securing a safe anastomosis is that the first suture line between the esophagus and the jejunum be placed before the stomach is removed. If the esophagus is extended 2 in below the diaphragm total gastrectomy is facilitated (Kirklin, 86). The details of the technique of total gastrectomy are well described by Clute and Albright (35) (See also Clute, 33, and Atkinson and Masson). Carcinoma of the stomach involving the colon has been resected *en bloc* by C. W. Mayo, and Rankin reports a case of carcinoma of the colon involving the stomach in which a successful simultaneous resection of the colon and stomach was done. Clute (34) reports a two-stage operation for carcinoma of the stomach. A gastro-enterostomy was done first and a gastrectomy from two to three weeks later. Balfour (14) advises the two-stage operation when the patient is in poor condition and the mass at the pyloric end of the stomach is fixed to the regional nodes and to the pancreas, and when the duodenum is inflamed and thick.

When a curative operation is not possible some type of palliative operation must be carried out. When there are widespread metastases, removal of the growth is the "best and most effective palliative" (Balfour, 16). Balfour (11) believes that

"an excellent substitute" for removal is the gastric exclusion operation of Devine. In this operation the stomach is divided above the growth, the distal segment is closed and left in place, and the jejunum is anastomosed to the proximal stomach segment by a Polya type of anastomosis. Maingot and Pack and Scharnagel (127) also think that exclusion is the best palliative measure for an irremovable carcinoma of the pylorus. Gastro-enterostomy is usually unsatisfactory as a palliative (Balfour, 11, Lahey, 93, 92). Jejunostomy has few indications (103). Lavage and proper diet are important for the patient's comfort (16).

X-ray therapy is of negligible value in the treatment of carcinoma of the stomach. "Practically all malignant tumors of the stomach," says Horsley (73), "except lymphosarcoma and small round cell carcinoma are radio resistant." Pack, Scharnagel, Qumby, and Loiseaux (128) believe that "less than 10 per cent of gastric cancers exhibit any considerable degree of radiosensitivity." They have advised radium packs as a palliative. Levin does a palliative operation and inserts radon. Chamberlain (30) reports 2 cases operated upon by Moynihan which were apparently inoperable. The abdomen was opened and from thirty to forty minutes of x-ray treatment were given directly to the tumor. Six weeks later on reopening of the abdomen the tumor was found to be smaller and much more freely movable. Partial gastrectomies were done and the patients were alive and well four and one-half and three years, respectively, after the operation.

After subtotal gastrectomy Marshall (108) gives 500 c cm of blood. Elderly people are placed in oxygen tents and intratracheal suction is frequently used. The Levine tube is used and the stomach is kept empty for three or four days. From 3,000 to 3,500 c cm of fluid are administered per day. Wilkinson (102) of the Lahey Clinic gives the following plan for diet after subtotal gastrectomy: fourth day, water, $\frac{1}{2}$ oz per hour with Levine tube clamped, fifth day, water 1 oz per hour, sixth, seventh, and eighth days, water from 2 to 3 oz per hour and from 1 to 2 oz of malted milk made with water or strained cream of wheat gruel every hour, ninth and tenth days, addition of whole milk as alternate feedings, eleventh, twelfth and thirteenth days, addition of semi-solid food and cream; fourteenth and fifteenth days, small feedings of solid food every two hours. After this the diet will be fuller and the patient may eat anything which does not disagree with him. As the stomach gradually stretches and its capacity increases the 5 meals will be reduced to 3.

It is a tragic challenge to the medical profession that the present operability of gastric cancer is only from 0 to 25 per cent while in the early stages of the disease probably 90 per cent of the cancers could be satisfactorily removed (Balfour 15). Balfour (15) has summarized the results after a study of 4,793 cases of carcinoma of the stomach which were operated upon. When the growth and the regional glands can be thoroughly extirpated 30 per cent of the patients will live five years. When there are no lymph nodes 48 per cent will live five years and when there are involved lymph nodes 18 per cent will live five years. The growth was removed in 45 per cent of the 4,793 cases. This 45 per cent was 19 per cent of all the cases in which a diagnosis of carcinoma was made. In the cases merely explored the average life expectancy was five months and when a palliative gastroenterostomy was done it was only one month longer. Balfour found the number of five year survivals to be higher in old patients in patients with a longer duration of symptoms in patient with an approximately normal secretory function in those who had larger lesions in those whose lesions were further away from the pylorus in those without lymph nodes and in those whose grading on the Broder scale was least malignant. Balfour (10) believes that a patient may be cured even if all the involved lymph nodes are not removed. MacCarty and Mahle (10) studied longevity in gastric carcinoma in relation to cell differentiation and lymphocytic infiltration. They found that patients without glandular involvement but with lymphocytic infiltration lived 124 per cent longer than those without lymphocytic infiltration. Of patients with glandular involvement those with lymphocytic infiltration lived 146 per cent longer than those without lymphocytic infiltration. Bastianelli (19) believes we can hope for a cure of carcinoma of the stomach in 7 per cent of the cases. Of Holman's reported series of 1,250 resections 15 per cent were considered probable cures. In Vinnes and Geschickter's series of 3,000 cases at Johns Hopkins Hospital there were only 3.5 per cent of five year cures. Gatewood (55) studied 417 cases of carcinoma of the stomach 50 per cent were inoperable upon admission. Of the operations performed 28 per cent were resections with an operative mortality of 32.6 per cent. In his series the average post-operative life after mere exploration was six and one tenth months after gastro-enterostomy eight and seven tenths months and after resection four years and nine months. Forty six per cent of the patients leaving the hospital lived

three years or more. Auschutz studied 437 resections of the stomach for carcinoma at Kiel. Of 3,283 patients 70 per cent lived more than one year, 28.40 per cent lived more than two years, 26.29 per cent lived more than three years, 19.19 per cent lived more than seven years, 19.13 per cent lived more than eight years, 1.13 per cent lived more than ten years and of 102.13 per cent lived more than fifteen years. After the Billroth I operation 64 of 253 patients (25 per cent) died. After the Billroth II operation 75 of 211 (36 per cent) died. The survival after the Billroth I operation was three years in 33 per cent of the cases, five years in 22 per cent and ten years in 16 per cent. The survival after the Billroth II operation was three years in 24 per cent of the cases, five years in 16 per cent and ten years in 9 per cent. St. John Whipple and Raiford (14) found 26 of 98 patients who had undergone resection (23 per cent) to be living after five years. Marshall and Taylor (109) have survivals after total gastrectomy for four, two and one half and one and one half years. Lake reports a series of 51 resections of the stomach with an average survival of two and one half years. Fowlands reports patients who are well sixteen and one half years and eleven years after resection. Schwytzer reports a case of carcinoma of the stomach without recurrence twenty four years after a resection. Judd (79) reported a patient in whom the tumor was attached to the pancreas who was well twelve years after the operation.

SUMMARY

Carcinoma of the stomach is one of the most important subjects before the medical profession and the lay public today. Its annual death rate of over 27,000 in the United States is far higher than that of cancer of the uterus or the breast. The early diagnosis is difficult but should be made much more frequently. In very early cases surgical treatment should cure the great majority of cases. Indigestion or loss of appetite should be regarded seriously in any patient over thirty years. The symptoms may suggest those of ulcer or even of cholelithiasis. The roentgen examination is the cornerstone of the diagnosis and should be made upon the slightest suspicion and repeatedly. Lump in peristalsis and changes in mucosal patterns often will give a clue to early diagnosis. The late roentgen diagnosis is usually easy. The present operability of carcinoma of the stomach is only about 20 per cent and should be greatly increased. The operative mortality of gastric resection in skilled hands should be less than 15 per cent. In Balfour's large series of

cases 48 per cent of the patients having gastric resection for carcinoma when there were no metastases lived five years Thirty per cent of those with and those without metastases grouped together lived five years Twenty-three per cent of Warwick's patients with carcinoma of the stomach died without metastases The best palliative operations are gastric resection and exclusion (Devine) Painless death from liver metastases seems preferable to starvation from gastric obstruction Age and the general condition of the patient are usually inconclusive so far as the prognosis goes, and x-rays are unreliable in the determination of operability Survival after gastric resection for carcinoma for as long as twenty-four years has been reported and ten-year survivals are not uncommon

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SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Clairmont, P Peritonitis Due to Perforation, with Special Consideration of that Due to Appendicitis and Ulcer (Die Perforationsperitonitis mit besonderer Berücksichtigung der Appendicitis und des Ulcus) *Wien klin Wchnschr*, 1938, 1 7

Clairmont discusses appendicitis and leaves the discussion of ulcers and tumors to Kunze. The author absolutely agrees with the 12 rules of Kirschner cited at the Fiftieth Surgical Congress in 1926. The purulent exudate must be evacuated and the source of the infection walled off and removed. Irrigation must be limited to certain cases. The exudate is to be carefully sponged or removed by suction, with the realization that removal cannot be complete. Kunze describes the irrigation with a hydrochloride-pepsin solution according to Schoenbauer in von Eiselsberg's Clinic. In general Clairmont rejects the use of irrigations with other measures because he believes that the damage to the peritoneal surfaces is not warranted by the results produced. Even the favorable experience of Behan with 70 per cent alcohol, by means of which he supposedly reduced his mortality from 50 to 45 per cent needs a critical review.

"Each attempt to drain the free peritoneal cavity is considered useless and therefore should be eliminated" (seventh rule of Kirschner). Kirschner found when he followed these rules that his mortality decreased from 87.5 to 30.1 per cent. In appendicitis alone the reduction was from 83.3 to 20.8 per cent. Clairmont has collected his cases of perforated appendicitis from 1919 to 1925. He found a generalized exudate in 146 cases of 172 (85 per cent, sterile in 26, infected in 86, not examined in 34). The total mortality in the 172 cases was 4 per cent. Eighty-six per cent of the cases were closed without drainage and healed with primary union. Independent of this series was a group of 81 cases of most serious diffuse peritonitis. The mortality amounted to 37 per cent. In the undrained cases the mortality was 28.5 and in those widely drained 57 per cent. Fundamental considerations mentioned by Clairmont are that drainage leads to loss of fluids, damage to the endothelium of the peritoneal surfaces, and frequent adhesions and paralytic ileus. Extrapertoneal abscesses should, of course, be drained. Marchini found that in 184 drained cases of appendicitis 9 patients died, while in 170 not drained only 2 died. Furthermore, in 70 drained cases of general peritonitis 31 patients succumbed, while in 34 not drained 7 died.

The postoperative treatment in the undrained cases is very important and sometimes surgical intervention for abscess is necessary. Certain rules must be followed and Clairmont describes the different possibilities:

1 Anterior parietal abscess, easy to diagnose and easy to open

2 The mesoceliac abscess, deep in the ileocecal region, more difficult to diagnose but easy to open

3 Right ileo-inguinal abscess, easy to diagnose

4 Abscess in the pouch of Douglas. Daily rectal examination should be made. When the signs first appear, the abscess must not be opened immediately, after from twenty-four to forty-eight hours drainage may be carried out. The sphincter is dilated and an aspirating needle is inserted. If pus is found an incision is made with the needle in place. Drainage is continued for two or three days.

5 Suprapubic abscess with bladder symptoms, not palpable per rectum but easily felt in the midline above the symphysis. This is easy to drain.

6 An abscess on the left side, which is an absolutely regular type found in children. It appears about two finger breadths above the left inguinal ligament to the medial side of the colon and is easy to recognize and drain.

7 Left subserous inguinal abscess, external and anterior to the colon. Opening is made as far lateral as possible to avoid an entrance into the free peritoneal cavity.

8 Left subphrenic abscess is to be expected in some of these cases.

9 Abscess in the middle of the peritoneal cavity seldom occurs. Diagnosis and treatment may be difficult.

10 Right retrocecal abscess is very frequent in acute retrocecal appendicitis, but seldom occurs during the postoperative course.

11 Right subserous inguinal abscess. This is situated lumbar to the surface of the ascending colon.

12 Right subphrenic abscess which may occur either anteriorly or posteriorly, but usually posteriorly. The diagnosis may be difficult and x-rays may give little help. This abscess is to be opened extrapleurally. The transpleural approach is not advisable, injury to the pleurae can be avoided if one drains from 3 to 5 mm under the peritoneal edge after resecting the twelfth rib.

13 and 14 Abscess in the mesentery of the small intestine or beneath the hepatic flexure of the colon is rare. Both are difficult to diagnose.

15 Abscess in the thoracic cavity.

The surgeon must bear these possibilities in mind and realize that abscess is not the consequence of failure to drain the peritoneum, but, on the contrary, through drainage the regular course of the abscess is disturbed. The author leaves to Kunze the discussion of the use of peritonitis serum, the "laparophoslampe" of Haohce, and the infra-red rays as described by Daschoud. The question of paralytic ileus has not been definitely solved. Cecostomy has been highly lauded. Jones is said

to have decreased his mortality from 57 to 14 per cent but Clairmont rejects the procedure as an immediate measure and reserves enterostomy for later on. The drugs prostigmin and vasopituitan are a distinct advance over former treatment. In hopelessly advanced cases of peritonitis Clairmont agrees with Reckes that the treatment should be conservative. 37 per cent of his patients in this condition are said to have recovered.

(FRANZ) JOHN A. GILS, M.D.

Scalfi A. A Case of Pick's Disease Treated by a Combined Brauer and Talma Operation (*Su di un caso di morbo di Pick trattato con operazioni di Brauer e di Talma associate*) *Ann Ital d Chir* 1938 17 335

The author reports on a case of Pick's disease in a twenty-four year old male patient whose past history was essentially negative. At the age of fifteen he noted at various intervals pain in the epigastric region accompanied by a burning sensation and difficulties in digestion. Later a tumefaction of the abdomen appeared accompanied by a marked increase in the volume of the liver. Following a paracentesis the patient's condition improved temporarily but within a short period of time the ascites reappeared. When seen at the clinic the patient was found to be markedly dyspneic and cyanotic. Upon physical examination the apex impulse on the chest was found to be absent. The area of cardiac dullness was found to be markedly increased. On auscultation a cardiac arrhythmia was detected. The cardiac sounds were distant, the first sound at the apex was muffled and the second pulmonary sound was reduplicated. The heart rate was between 100 and 110 beats per minute and the pulse was irregular, small and soft. Examination of the abdomen revealed a markedly enlarged liver and the presence of ascites. The x-ray film of the chest showed the presence of retrocardiac adhesions in the posterior mediastinum with a distinct zone of calcification. In view of these findings a diagnosis of Pick's disease (adhesive pericardiomediastinitis with enlargement of the liver and ascites) was made.

Under local novocaine anesthesia a horseshoe shaped pericardial incision was made and following dissection of the musculocutaneous layer a subperiosteal resection of the third to the sixth rib inclusive was made. A portion of the periosteum was left in place in order not to injure the subjacent pleura which appeared thickened and grayish. Following the osseous resection the area was retracted posteriorly and a marked cardiac impulse could be noted. A drainage tube was placed in the seventh intercostal space and the wound was repaired in layers. The postoperative course was good. The patient was subjectively improved, the heart rate was reduced to 80 beats per minute, the dyspnea was increased and the dyspnea was relieved but within four months fluid reappeared in the abdomen and the patient's condition became gradually worse. A second surgical intervention was considered and un-

der local novocaine anesthesia a supraumbilical laparotomy was performed. After removal of the ascitic fluid a subperitoneal omentopexy (Talma operation) was performed. The abdominal wall was closed in layers and the wound healed by first intention. The patient made an uneventful recovery. There were no recurrences and the patient was able to resume his normal activities.

According to Scalfi Pick's disease is defined as a syndrome which is characterized by the presence of adhesive and sclerotic processes involving the mediastinum and the peritoneum. The condition has therefore most appropriately been called cardiac hepatic cirrhosis. The author believes that Brauer's operation alone is not sufficient to produce permanent relief. The best clinical results are obtained by combining Brauer's operation with Talma's operation.

The Italian Society of Internal Medicine classifies these and allied conditions into three basic groups: (1) adhesive mediastinopericarditis without lesions of the endocardium and peritoneum; (2) adhesive mediastinopericarditis associated with lesions of the endocardium; and (3) syndromes characterized by the presence of adhesive and sclerotic processes involving the mediastinum and the peritoneum (Pick's disease).

RICHARD E. SOLOMON, M.D.

GASTRO INTESTINAL TRACT

Orr T. G. and Rumold M. J. Experimental Pyloric and Jejunal Obstructions. Absorption of Sodium Chloride from the Stomach and the Upper Part of the Small Intestine. *Arch Surg* 1938 37 295

Orr and Rumold have suggested in previous experimental work that absorption of water from the stomach and upper part of the small intestine in the presence of organic obstruction may be of some therapeutic importance. Dogs with obstruction of the upper part of the jejunum 15 cm. below the ligament of Treitz lived more than twice as long as did animals receiving nothing by mouth. This indicates that water was absorbed from the upper part of the intestinal tract in spite of obstruction and continued vomiting.

A series of experiments was performed to determine the effect of a solution of sodium chloride, a solution of 10 per cent alcohol and a combination of alcohol and sodium chloride given by mouth on the length of life of animals with jejunal obstruction. In a second series of experiments the pylorus was obstructed and a comparison made of the chemical changes in the blood of animals receiving a solution of sodium chloride and water.

The lifespan of dogs with jejunal obstructions was more than doubled when they received sodium chloride rather than water only. Sodium chloride given by mouth to animals with experimental jejunal obstruction was absorbed in sufficient quantity to maintain the chloride content of the blood at an average level just below normal. With water alone

there was a marked and constant decrease in the chloride content

Alcohol, or a combination of alcohol with sodium chloride, given by mouth, did not appreciably lengthen the life of the animals. However, the sodium chloride prevented chemical changes characteristic of untreated jejunal obstruction in the blood.

In dogs with pyloric obstruction, the drinking of solutions of sodium chloride produced a greater increase in the non-protein nitrogen content than did the drinking of water. The constant increase in the creatinine content in the dogs receiving sodium chloride was striking, since this did not occur in any other group. The increase in non-protein nitrogen and in creatinine in dogs with pyloric obstruction which were given sodium chloride by mouth indicated that sodium chloride did not offer the same protection against these changes to animals with this type of obstruction as to animals with obstruction of the jejunum.

JOHN W. NUZZUM, M.D.

Fieschi, A., and Zelaschi, C. Gastro-Appendicular and Colo-Appendicular Reflexes (Riflessi gastro-appendicolari e colon appendicolari). *Arch. ital. di mal. dell'appar. digerente*, 1938, 7, 350.

The authors studied the reflex actions of the stomach and colon upon the appendix. Contrary to other investigators who produced gastric distention by means of barium meals, the authors used a gaseous mixture. During the period of distention, which lasted a few minutes, as a rule, serial x-ray films were taken of the ceco-appendicular region.

Studies of these films revealed marked modifications of the appendix and of the ceco-appendicular region. These phenomena were also observed in patients with a peptic ulcer. In many cases this reflex reaction was immediate and involved sometimes the entire vermiform process and sometimes its proximal portion. All the movements observed were due unquestionably to variations in tone of the vermiform process, the organ was seen to straighten out or to become contorted in a spiral-like fashion, and in some cases the segmentations were accentuated. These reactions were more evident in cases in which the appendix was not pathologically altered and in cases in which the organ was long.

Under the influence of the gastric reflexes, the proximal portion of the appendix was found to become shortened, whereas the antrum became simultaneously dilated. In some cases the organ appeared festooned, probably because of peristaltic activity, whereas in other cases the proximal segment was found to approach the cecum. This latter reaction was probably due to a dislocation of the cecum.

All these observations can thus be summarized by the statement that a filled stomach produces reflexly hypertonic and hyperkinetic reactions in the appendix.

The colo-appendicular reflexes were studied by insufflation of the colon with air. The quantity of air introduced depended primarily upon the toler-

ance of the patient to pain. The serial films were taken in rapid succession in order to study the immediate reactions. Pathologically altered appendices failed to react to a reflex stimulation exerted by a filled colon, whereas reflex reactions occur constantly in normal vermiform processes. The most commonly encountered movements are of the tonic type, the organ is seen to straighten out or to retract upon pre-existing angulations. In other cases the appendix becomes shortened and shows a tendency to empty itself. The antral region becomes shortened and the proximal portion apparently becomes more rigid. All these observations clearly demonstrate hypertonic reactions. It should be noted that in a few cases the appendix reacts atypically to this reflex stimulation.

It is interesting to note that, along general lines, profoundly altered appendices show a sluggish response, if any at all. This is due to the infiltration of the organ, to a perivisceritis, or to lesions of the smooth-muscle cells. This latter observation may prove to be of considerable diagnostic value.

RICHARD E. SOMMER, M.D.

Clute, H. M., and Sprague, J. S. Gastroduodenostomy for Certain Duodenal Ulcers. *J. Am. Med. Ass.*, 1938, 111, 909.

Clute and Sprague have described their technique of gastroduodenostomy and the results they have obtained therefrom. The procedure appears more physiological because it empties the gastric content into the duodenum rather than into the jejunum. However, they found that 5 of their patients, after a gastroduodenostomy, had total and free acids which were nearly as high as or higher than they had been before operation. This observation was surprising to them because all of the patients were clinically well, and recent x-ray studies showed no evidence of pathological changes. After reviewing the literature, the conclusion is drawn that "only 3 stomal ulcers (have occurred) after nearly 400 operations, an incidence of less than 1%." This is contrasted with the 8.5 per cent of stomal ulcers reported by Wright, of England, in his careful collective inquiry of 1935. The fact is noted, however, that Graham reported 1 stomal ulcer in 9 gastroduodenostomies done by him.

In the authors' experience, gastroduodenostomy has been satisfactory in relieving pyloric stenosis. It has been used in the cases of 7 patients during the past three and one-half years. Four of these patients were in a serious condition when first treated. The postoperative course of these patients was surprisingly comfortable. This same procedure was used in the cases of 2 additional patients who had persistent pain in duodenal ulcers despite long medical treatment. They have both been well for one and two years, respectively, but, to date, show high values for total acidity. Because of the persistent postoperative high gastric acidity, Clute and Sprague have hesitated in using the operation for non-obstructed duodenal ulcer in patients in whom medical management has failed, and they believe that

they would be more optimistic about the future of the 2 last mentioned patients if a subtotal gastrectomy had been done

The same surgical procedure has been used in patients with duodenal ulcer who have had massive gastric hemorrhage. Although the procedure is not ideal for this complication it permits exposure and suture of the bleeding vessel in the base of the duodenal ulcer and it is indicated for certain bleeding ulcers in patients who are in poor condition. In addition the operation has been used with resection of an ulcer situated very high on the lesser curvature of the stomach but the routine use of this operation for ulcers of the lesser curvature is not recommended.

Gastroduodenostomy has also been particularly helpful in the successful management of 2 bleeding gastrojejunal ulcers in which it was possible to remove the jejunum from the stomach, remove the ulcer from the jejunal wall, close the jejunum and overcome the pyloric obstruction. The ideal procedure at the present time in patients of this type, i.e. gastric resection, occasionally proves to be too much in the way of surgical intervention. For this reason gastroduodenostomy is substituted for gastric resection.

SAMUEL J. FOGETSON, M.D.

Ogilvie, W. H. The Approach to Gastric Surgery. I. Cancer of the Stomach. II. Ulcer of the Stomach. *Lancet* 1938, 235, 235, 293.

I. Cancer of the stomach. Cancer of the stomach is important not only because it is the most common of all cancers in the United Kingdom but also because the deaths from this condition are so numerous and its cures so few. Analysis of the author's statistics show that 50 per cent of all patients presenting themselves were clearly beyond treatment of any kind. The presence of nodules in the liver, glands above the clavicle, jaundice, ascites or a hump in the pouch of Douglas indicates widespread metastases. About 40 per cent of all patients submitted to laparotomy are beyond any surgical treatment; in 20 per cent only a palliative operation is feasible and 40 per cent are suitable for radical resection. From 5 to 30 per cent of the patients admitted to the hospital die there.

In patients who have had only a laparotomy or a short circuiting operation the survival time is seldom longer than six months. Those who have had palliative exclusion may live one, two or occasionally three years. They not only lose their symptoms but they gain weight and strength and are often able to work until nearly the end. Those who have had radical resections show a similar improvement but not many survive the five year period and of these the majority die before the tenth year. The percentage of five year cures resulting from all operations is from 5 to 10 per cent. The percentage of cure from all the gastrectomies is from 15 to 17 per cent and the percentage of patients surviving gastrectomy is about 25 per cent. In other words about 5 per cent of all the patients admitted to the hospital survive five years or more. The high operative death rate about 30 per cent is not a matter of

lack of skill and remains practically the same as that reported by Paterson in 1906 for the first large collected series of gastrectomies for cancer.

The present percentage of cures can be increased in one of two ways: by operation upon a greater number of patients while the disease is still within the limits of radical operation or by extension of the radical operation. In cases in which the history is in any way suggestive of cancer of the stomach Ogilvie pushes his investigation until he is 100 per cent certain that the stomach is normal. The negative assurance of a barium meal is of little value as even large tumors may be missed in a routine examination. There may be no filling defect, no deformity and no crater but peristalsis is absent over the affected segment from the beginning and this immobility can be demonstrated by lymphography. The gastroscope may render definite aid in doubtful cases in which the history suggests cancer and radiography does not.

The ulcer-cancer question should be regarded far more critically. Malignant transformation of a simple peptic ulcer is believed to be uncommon. It is no higher than 5 per cent at most. Many ulcers of the body of the stomach which are considered benign are malignant from the beginning.

The extension of a radical operation is not easy. In view of the fact that cancer spreads by (1) direct invasion of adjacent tissues, (2) extension along lymph vessels, (3) dissemination through the blood stream and (4) implantation of detached cells on a surface, all of the characteristics may be taken into consideration in the operative treatment. All malignant tissues should be removed but it is impossible to remove blood stream metastases and rarely feasible to remove more than part of the free surfaces exposed to the possible insemination of detached cells. For this reason the technique of gastrectomy is extended in the surgical management of gastric carcinoma so that a larger gastric segment together with the greater gastroepiploic omentum from the posterior abdominal wall and the entire greater omentum is removed.

II. Ulcer of the stomach. Ulcer is not a particularly fatal disease; it is however a very disabling one. The patient wants his digestive apparatus to work properly but would rather keep his indigestion than die of a cure. The surgeon must ask himself what has gone wrong in the function of the stomach and how to put it right. An attempt is made to answer this question by discussion of the cause of gastric ulceration and the mechanism of gastric secretion. The types of operation available for the treatment of ulcers fall into 3 groups: gastrojejuno-stomy, the operations around the pylorus and gastrectomy.

Gastrojejunostomy has become an almost standardized procedure. It is a masterpiece of technical design but when it is used for the treatment of active ulcers without stenosis especially in cases with a high acid content and rapid emptying time it fails to give more than temporary relief. It will

cause a duodenal ulcer to heal by diverting acid from the ulcer site, but it transfers the factors that caused the ulcer to a new part of the intestine, which is undesigned to combat them and is unprotected by any sphincter

The operations around the pylorus have the advantages, as claimed by some, that they can be performed when posterior gastrojejunostomy is technically impossible or inadvisable, that they allow direct inspection and exclusion of the ulcer, which is a considerable advantage if there has been severe hemorrhage, and that they bring the gastric juice to a surface protected against acid damage by Brunner's glands

Ogilvie finds it difficult to pronounce upon the rival claims of these two groups of operations, but he can commend neither in the absence of some stenosis, and believes that the proof that gastroduodenostomy is less likely to be followed by recurrent ulceration is still lacking. He quotes the motto of the gastric surgeon "Hope for the best and prepare for the worst." Should a gastrojejunostomy go wrong it can be undone and the parts can be returned to their normal arrangement, but if a gastroduodenostomy fails, there is no cure other than that of gastrectomy

It is impossible, short of a total gastrectomy, to abolish the acid-secreting potentialities of the stomach because the whole fundus is lined by principal glands. The postoperative reduction of acid secretion is quantitative and not qualitative. The remaining gastric segment is capable of secreting acid of equal concentration, but in smaller amounts, into a smaller cavity. However, psychic secretion is greatly diminished by a gastrectomy that is carried sufficiently high in the lesser curve to divide a large number of the vagal branches. Chemical or after-secretion no longer occurs when the pyloric antrum is removed

In his conclusion Ogilvie states that the best thing that can be done for derangement of the gastric function is the restoration of normal function. The best thing we can do for ulcer is to heal it and leave the stomach and duodenum as they were before. This can be done by medical treatment if it is instituted early and followed continuously. Surgery can treat the complications of ulcer, but it can deal with the cause only to a limited extent, and then by alteration of the whole digestive tract. In other words, medical treatment can heal most of the gastric ulcers, but if it does not do so when they are in the early stages, it becomes increasingly ineffective, and when the ulcer is fixed to neighboring structures it is a waste of time. Cancerous transformation is not common but it is a greater risk than radical surgery. Surgery is therefore indicated for the same absolute conditions found in duodenal ulcer, perforation, stenosis, and major hemorrhage, as well as after failure of medical treatment. Because the acid level in gastric ulcer is rarely above normal, the type of operation adopted is less important, but gastrectomy is undoubtedly the most

straightforward and satisfactory method of restoring a working digestive mechanism

SAMUEL J. FOGELSON, M.D.

Grossman, A. Postoperative Jejunal Ulcer. *Ann Surg*, 1938, 108, 105

The material for this study consisted of 23 cases of postoperative jejunal ulcer in which operation was performed at the Presbyterian Hospital, New York. Histories of the patients were studied in minute detail from the time of the appearance of the original duodenal or gastric ulcer, through the operations, and up to the ultimate status at the present time. Nine of the patients did not have their first operation at Presbyterian Hospital.

Ten case reports are presented in detail, each of which demonstrates at least one interesting factor in the genesis of postoperative jejunal ulcer. From these data the author has learned that the interval between gastro-enterostomy and evidence of the incidence of jejunal ulcer may vary from twelve days to eighteen years. In 7 cases more than five years elapsed between the operation and the first recurrence of digestive symptoms. In 9 cases the first roentgenological evidence of jejunal ulcer appeared from six to seventeen years postoperatively. These figures suggest the fallacy of conclusions drawn from gastric surgery based upon a follow-up of five or even ten years.

The material further suggests that the treatment of postoperative jejunal ulcer should begin even before the patient has the initial operation. For example, 6 of the 23 patients were operated upon during their first attack with antecedent symptoms which had been present from one week to three months. In 9 of the 23 cases, the duration of symptoms was less than eight months. In only 3 cases was there any evidence that medical treatment had been followed faithfully for any appreciable time. Four patients had received practically no medical treatment, although in no case was the operation considered an emergency. In 3 cases (operated upon elsewhere) the records of the symptoms prior to operation were insufficient to permit any conclusions regarding the indication for operation. In no instance in which obstruction was considered the indication for operation had belladonna, or any other anti-spasmodic preparation, been given a prolonged trial pre-operatively.

A long anterior gastro-enterostomy is usually followed by a jejunal ulcer, particularly when an entero-enterostomy is added. Three patients developed jejunal ulcers in six months, three and one-half weeks, and twelve days, respectively. Entero-enterostomy, by preventing adequate neutralization of gastric acidity, is dangerous when combined with an anterior gastro-enterostomy. It exposes a more vulnerable loop of jejunum to highly acid gastric juice. In 5 cases an entero-enterostomy was established at a subsequent operation for jejunal ulcer. Four of the patients developed their second jejunal ulcer in one month, six months, three and

one half weeks and six months respectively. In the cases of these patients two years two and one half years one year and seven years respectively had elapsed after the first operation which in no instance included entero-enterostomy before the development of jejunal ulcer.

From a study of this material the author concludes that it is obvious that the best treatment of jejunal ulcer is its prevention. This does not necessarily mean the performance of less gastric surgery. The fact that only 23 cases of postoperative jejunal ulcer could be found in the files of the Presbyterian Hospital is in itself a recommendation for gastric surgery. It simply means that absolute indications must be present for surgical intervention and that the patient's unwillingness to adhere to medical measures does not constitute an indication for surgery. The patient should also be properly informed of the importance of dietary measures taken postoperatively. He should be warned to return to the most vigorous type of ulcer regimen at the slightest recurrence of symptoms. Tobacco and alcohol should be forbidden. Foci of infection eradicated preferably pre-operatively and if despite such precautions jejunal ulcer still develops immediate vigorous medical therapy should be resumed surgery being reserved for the late complications of jejunal ulcer.

SAMUEL J. FOGELSON, M.D.

Cameron A. L. Primary Malignancy of the Jejunum and Ileum. *Ann Surg* 1938 108 293

The author's paper is based upon 4 cases of primary malignancy of the jejunum and 196 similar cases reported in the literature during the past eight years. Carcinomas malignant carcinoids and sarcomas comprise these malignancies. The carcinomas outnumbered the sarcomas in the proportion of 5 to 4 and the malignant carcinoid 8 to 1. Primary malignancy attacks the extremities of the jejunum with greatest frequency but it is found in the intervening portions in one third of the cases. Carcinoma predominates in the proximal quarter of the jejunum and sarcomas in the distal quarter of the ileum. Malignant carcinoids are most common in the ileum especially in the terminal portion.

Carcinomas are predominantly of the adenomatous type. The sarcomas include fibrosarcomas leiomyosarcomas and malignant lymphoblastomas. The latter are of lymphoid tissue origin and include lymphosarcoma Hodgkin's disease of the intestine and reticulo endothelioma. One third of the entire sarcoma group involves the connective tissue and smooth muscle while two thirds involve the lymphoid tissue.

The symptoms vary greatly in kind and degree and depend on the size location extent of the primary and possible secondary growths and the presence or absence of intestinal obstruction. The onset of symptoms may be sudden and severe as in perforation intussusception or sudden occlusion. Usually however it is insidious and consists of anorexia dyspepsia weakness fatigue loss of

weight and often constipation. Blood in the stool and occasionally an abdominal mass are noted by the patient.

The positive abdominal findings are for the most part those of chronic obstruction (plus tumor in the sarcoma cases). Acute obstruction and perforation are relatively uncommon. In the cases of carcinoma palpable tumors are rare while in those of sarcoma they are noted in 65 per cent. Roentgenography is by far the most valuable single method available for the diagnosis of primary neoplastic disease of the small bowel. However since only three quarters of the cases are obstructive in type this proportion at best can be detected by x ray studies. Actually neoplasia was suspected only in 25 per cent of the cases of recognized obstruction. A consideration of the history physical findings laboratory data and roentgenographic evidence indicate that the history and x ray findings are the most uniformly positive and suggestive. Positive physical findings such as a palpable tumor and positive laboratory findings such as blood in the stool are also significant but never essential for diagnosis. The non-obstructive cases present almost in unmountable diagnostic difficulties.

Approximately two thirds of the cases are operable. The operative mortality is 30 per cent and the five year survival less than 10 per cent.

ARTHUR S. W. TORRER, M.D.

Perazzo G. Zavaleta D. E. and Artuso C. F. Acute Volvulus of the Cecum (Vólvulo agudo del ciego). *Rev Méd Lat* 1m 1938 23 806

The authors state that volvulus of the cecum occurs rather infrequently. From a study of the international literature it appears that since 1920 about 60 articles have been published on this subject.

With regard to the etiology and pathogenesis of this condition the authors take the following factors into consideration:

1. Predisposing congenital causes of which the most important is a hypermobility of the cecum or an incomplete rotation of the umbilical loop.

2. Among the acquired predisposing causes hypokinesia of the cecum has been held responsible for the development of the condition. As immediate causes cecal distension caused by a vegetarian diet constriction of the ascending colon and insufficiency of Bauhin's valve have been mentioned. Many other pathogenetic theories have also been advanced.

3. The immediate causes are usually directly related to an exaggerated peristalsis which might be produced by a sudden contraction of the abdominal muscles sudden colic the administration of drastic purgatives or vermifuges the ingestion of ice cold drinks traumatism violent movements of the body involving the abdominal musculature violent vomiting strained defecation and parturition.

Acute volvulus of the cecum has a stormy and abrupt onset accompanied by vivid pain localized

in the right iliac fossa Vomiting appears early At first bilious, the vomitus soon becomes stercoraceous Defecation does not cease abruptly, the complete abolition often being preceded by diarrhea The patient's facial expression suggests acute illness, the tongue is dry, the pulse is accelerated, and the temperature is usually normal or, at most, slightly raised The abdomen appears asymmetrically distended and there may be a moderate rigidity Palpation usually reveals the presence of an elastic, tender, and relatively fixed mass

In untreated cases death occurs usually on the third day following the appearance of the symptoms, but it may be delayed to the seventh day or later The diagnosis is difficult and is usually made with the aid of an x-ray film interpreted by an expert roentgenologist The condition is commonly confused with acute appendicitis and cholecystitis The treatment is exclusively surgical The operation consists essentially in replacement of the cecum into the right iliac fossa and fixation to the tendon of the psoas minor muscle In some cases this operation may have to be followed by an intestinal resection or a colostomy

The authors observed and operated upon a case of acute volvulus of the cecum in a forty-seven-year-old man, and they discuss briefly 5 other cases taken from the Latin-American literature

RICHARD E SOMMA, M D

Shelley, H J • Chronic Appendicitis Is It a Clinical Entity? *Arch Surg*, 1938, 37 17

This study was undertaken in an attempt to determine whether or not there is such a clinical entity as chronic appendicitis The subject has been approached from three angles (1) the pathological changes in appendices which are supposed, either before or after the operation, to have been the cause of symptoms have been compared with the changes in those appendices which apparently have never been the cause of symptoms, (2) the incidence of pathological changes in appendices, supposed to have been the cause of symptoms, has been determined according to symptoms, physical findings, laboratory findings, sex, and age, (3) the percentages of the patients followed up who remained free from symptoms have been determined according to the pathological change found in the appendix and the other classifications just listed

The author has also listed the incidence of inflammatory changes in the appendix for the total number of cases in which the appendix was not the cause of symptoms, both when some other inflammatory lesion existed in the abdomen and when no other inflammatory lesion was noted The latter incidence was chosen for purposes of comparison in this study, as it was considered to be the nearest approach to the expectation of pathological change in the appendix when the patient has been erroneously operated on for chronic appendicitis

The percentages of follow-up cures were established as follows

A total of 704, or 80 per cent, of all the patients were followed up for an average of twelve and one-half months Of these patients, 87 per cent had no return of the symptoms which were the indications for their operations

The percentages of follow-up cures were found to be low when no inflammatory changes were present, cases involving atrophic appendices giving the lowest figures When inflammatory changes were found, a higher percentage of follow-up cures resulted from appendectomy These cures appeared not to depend upon the type of inflammatory change that was present, or upon its variation from the standard incidence as described When adhesions or fecaliths were found with a normal appendix, the percentage of follow-up cures was increased almost to that which was noted when inflammatory changes were present in the appendix

When the patients gave a history of more than one attack occurring within a period of one year or less, the percentage of follow-up cures was remarkably high It was low when the attacks covered a period longer than one year, and was still lower when the patients were operated upon during or following the first attack The incidence of inflammatory changes was unaffected by the presence or absence of a history of nausea and vomiting, although the percentage of follow-up cures was slightly decreased, in the presence of such a history When a history of constipation was given the incidence of inflammatory changes decreased slightly, as did the percentage of follow-up cures

Both the incidence of inflammatory changes and the percentage of follow-up cures varied directly with the definiteness of localization and the seriousness of the physical findings in the right lower abdominal quadrant, the highest figures being obtained when both tenderness and muscular spasm were present When tenderness was found elsewhere in the abdomen than in the right lower quadrant, the incidence of inflammatory changes checked almost exactly with that in patients who had had no symptoms or physical findings referable to the appendix, and the lowest percentage of follow-up cures resulted When the patients were operated upon only because of the history of attacks of pain in the right lower abdominal quadrant (no tenderness having been found after admission to the hospital), the results were the same as the average for the whole group studied The presence or absence of tenderness high on the right, detected by rectal or vaginal examination, bore no apparent relation to the incidence of inflammatory changes, or to the percentage of follow-up cures

The leucocyte count did not appear to bear a definite relation to the follow-up cures nor to the incidence of pathological change, although with a moderate increase in the leucocyte count there was a slight increase in the incidence of inflammatory changes The incidence of inflammatory changes in the appendix was found to vary directly with the definiteness of the localization and the severity of

the patient's symptoms as indicated by the diagnosis. This relation was corroborated by an equivalent increase in the follow up cures in the same sequence. When diagnoses other than appendicitis were made pre-operatively and the symptoms were attributed to the appendix after operation the percentage of follow up cures was low notwithstanding a high incidence of inflammatory changes. (The average age of these patients was much higher than that in the other groups.) This finding checked with the equally low percentage of follow up cures when tenderness had been noted elsewhere in the abdomen than in the right lower quadrant.

The incidence of positive Wassermann reactions was 2.4 per cent. This condition bore no demonstrable relation to either the pathological condition of the appendix or the follow up cures. The ratio of men to women was 1:2 with a slight increase in the incidence of inflammatory changes and percentage of follow up cures in the men. With an increase in the age of the patients there was a marked increase in the incidence of atrophic appendicitis, chronic catarrhal appendicitis and chronic obliterative appendicitis with and without infiltration, no definite change occurred in the incidence of simple chronic appendicitis and chronic exudative appendicitis and a marked decrease took place in the incidence of normal appendices. The changes in the appendices with increase in age of the patients were much greater than those in the appendices of patients who had not been suspected pre-operatively of ever having had any appendiceal pathological condition. Even after the small number of appendices presenting pathological changes other than inflammatory changes was taken into account the figures did show that these conditions increased in incidence in the presence of symptoms and physical findings attributed to the appendix and that appendectomy gave relief from those symptoms.

In the 881 appendectomies studied in this paper the mortality was less than 0.5 per cent.

It has been shown that when a patient has been operated on because of symptoms and physical findings diagnostic of acute or subacute appendicitis and instead one of the types of chronic appendicitis (or adhesions or fecaliths without inflammation) is found the expectation of a permanent cure is excellent. Ordinarily the surgeon lists these as mis taken diagnoses but the figures relating to the marked increase of the incidence of inflammatory change above those shown when no symptoms had been attributed to the appendix and the high percentage of follow up cures found in this study would indicate that the surgeon under such circumstances has benefited the patient almost as much as though acute appendicitis had been found.

One must bear in mind that before operation is done upon any patient for chronic appendicitis because of the conclusions arrived at in this paper the utmost diagnostic acumen must be exercised in ruling out all conditions which give a picture simulating that presented by chronic appendicitis. The ques-

tion of differential diagnosis outside the limitations of this paper and can be considered only after one has established the fact that there is definitely such a clinical entity as chronic appendicitis.

NORMAN C BULLOCK, M.D.

Gardner, C. E. Jr. Delayed Operation in the Treatment of the Perforated Appendix Surgery 1938 4 161

The author analyzes his experience with 248 cases of appendicitis with perforation.

In order for the treatment by delayed operation to be successful it is necessary that a proper selection of case be made, close supervision during the course of treatment be given and shrewd judgment as to the time of operation be exercised. The entire cooperation of the patient, of the patient's family and of the family doctor is an important factor.

The management by conservative treatment consists of Fowler's position, nothing by mouth, parenteral fluids (from 2,000 to 4,000 c.c. daily), gastric lavage when indicated, sedation in the form of opiates to alleviate restlessness or apprehension and complete knowledge of the usual bedside nursing observations such as temperature, pulse, fluid intake and output, amount of stomach drainage if present, occurrence of vomiting and pain and passage of flatus or feces.

The criteria for operation are: (1) failure of the mass to decrease in size after four or five days of treatment; (2) failure of the temperature to subside after a week; (3) increase in size of the mass; and (4) the occurrence of pain. If abdominal signs are found to be spreading, the pain increasing or the pulsating, immediate operation is indicated.

From 1930 to 1934 the delayed operation type of treatment was used only occasionally in a series of 122 patients with a mortality of 18 per cent. In the period between 1934 and 1937 the delayed operation type of treatment was used in all patients when indicated in a series of 126 cases with a mortality of 3.1 per cent. The reduction in the mortality rate was greater in the groups with local peritonitis in which the mortality fell from 10 per cent to 5 per cent and in the cases of abscess in which the mortality fell from 14.3 per cent to 4.2 per cent.

At the present time all patients with ruptured appendices are treated conservatively regardless of the stage of the peritoneal involvement of wide spread peritonitis.

Children with appendiceal peritonitis were treated conservatively only when localization had started. The conservative treatment was used in 15 children. In all of these the signs and symptoms subsided entirely and the patients left the hospital without operation to return in three months for an interval appendectomy. The other 4 children failed to respond and were operated upon. Three recovered and 1 died. With diffuse peritonitis evident, immediate operation was performed. There were 23 children with diffuse peritonitis, 22 of whom were treated by immediate operation and 1 by delayed

operation The mortality was 42.8 per cent In future children with generalized appendiceal peritonitis will be treated conservatively, like adults

In 60, or 78 per cent of the 77 cases treated conservatively, the entire inflammatory process disappeared by resolution If the process does not resolve it may then either become localized or spread and cause generalized peritonitis

In 53, or 78 per cent of the 68 patients who developed inflammatory masses, the masses disappeared completely under conservative treatment In 19 per cent (13 cases) the masses did not subside and they were drained at operation The appendix was not removed in any of these cases Of these 13 patients, 10 made a recovery and 3 died Of the patients with inflammatory masses, only 1 had spontaneous rupture and died

Complications developed in only 3, (5 per cent) of 60 patients in whom resolution of the peritoneal infection occurred without operation, and in 29, (20 per cent) of 145 patients who survived immediate operation

The author is of the opinion that appendectomy should be performed two or three months after the inflammation has subsided

For patients treated by immediate operation, the average hospitalization was twenty-six and one-tenth days Under conservative treatment when the symptoms subsided completely hospitalization was sixteen days If seven days be added to this last figure, which was the average period of hospitalization for interval appendectomy, the total was twenty-three days When operation was unsuccessfully delayed, hospitalization amounted to twenty-nine and seven-tenths days

RICHARD J BENNETT, JR., M D

Rea, C E., and Kleinsasser, L End-Results Following the Removal of an "Inactive" Appendix *Surgery*, 1938, 4 179

The authors report the results which followed appendectomy in patients whose histories and physical findings were suggestive of acute appendicitis, even though the gross and microscopic examination of the removed appendix failed to show any inflammation (inactive) One hundred and forty-three of such patients were available for study Of these, 53 were males and 90 were females All of the patients complained of pain in the right lower quadrant of the abdomen, 81 were nauseated, while 71 gave histories of vomiting, 24 had anorexia, 78 were seen during an acute attack, and 17 gave a history of one or more previous attacks The temperature ranged from 99.2 to 99.4 degrees The leucocytes were under 15,000 in all but 9 patients In 8 patients the urine showed albumin, and red or white blood cells X-ray studies were made of the kidneys, ureters, and bladder in 7 patients, and cystoscopic examination was made in the cases of 5 patients, with negative results Appendectomy through a McBurney incision was performed in all There were no deaths

Of 143 patients in whom an inactive appendix was removed, 102 were available for a follow-up study

Of these, 90 were in good health, while 12 suffered from the same, or recurrent similar symptoms Of 73 who had been operated upon four years previously, 78.1 per cent were well, while 21.9 per cent were not cured

Occasionally when the appendix is removed during what appears to be an acute attack of appendicitis, it will exhibit no evidence of acute inflammation In the light of the results of this follow-up study, the surgeon need not feel apologetic over the removal of an appendix that is inactive from the point of view of the pathologist It seems quite probable that many patients recover from appendicular colic and fail to exhibit microscopic evidence of active inflammation of the appendix Wangenstein has suggested that swelling of the mucosa and submucosa lymphoid tissue may occasion obstruction of the lumen, while augmentation of normal physiological obstruction to emptying by reflex nervous conditions may be an etiological factor in the "inactive appendix"

JOHN W NUTZ, M D

Stenholm, T Diverticulosis and Diverticulitis of the Colon (Ueber die Divertikulose und Divertikulitis des Dickdarmes) *Deutsche Ztschr f Chir*, 1938, 250 19

Graser, in 1898, was the first to describe acquired diverticula One should speak of diverticulosis only in the presence of a simple, non-inflamed hernia of the bowel These hernias are often observed as an incidental finding in a routine x-ray examination Only with the occurrence of inflammatory signs is a definite picture of clinical importance observed Diverticula are rare before the fortieth year of life, and men are affected twice as often as women The diverticula may occur at any point along the colon, but the sigmoid is the most common The causes of the formation of diverticula may be the weakness of the musculature of the bowel wall, unusually wide vessel spaces, nervous influences, and, especially, increased intraluminal pressure, as for instance, in chronic constipation If inflammatory signs are superimposed, one refers to the condition as diverticulitis The course is often very rapid with purulent degeneration, necrosis, or perforation Forcible frustes perforations are possible, as well as perforations into neighboring organs, as for instance, the bladder, and fistula formation The diverticulitis may cause a narrowing of the left ureter and thus a hydronephrosis, as well as a purulent phlebitis of the inferior mesenteric vein There is no definite proof of connection between diverticulitis and carcinoma Only Clairmont has reported a case in which these two conditions were present

The clinical and diagnostic signs are uncertain Inflammation in the vermiform appendix, peptic ulcer, and inflammation in the adnexa must be differentiated The author reports 1 case in which a perforated diverticulum resulted in peritonitis If the course is more chronic, one must differentiate colitis If there is a marked inflammatory tumor, carcinoma must be differentiated, although this can

be more easily done from the previous history. The symptoms are of long standing in diverticulitis and the patient does not have cachexia or blood in the stool. The inflammatory tumor is usually not as hard as in carcinoma. One cannot however rely too much upon these signs. Often the roentgenogram may give definite help. It is absolutely necessary that the bowel be cleaned well. By the administration of atropine before the roentgenogram is taken the small herniations are made more visible. The injection of air as described by Fischer often is of help. Because of the inflammatory changes in the wall of the bowel filling defect can be observed and easily be taken for a neoplasm. Nevertheless these inflammatory defects are usually more extensive than in carcinoma. The mucosa however is unchanged as can be seen in the mucosa relief film. The examination with the x rays is not entirely without danger as perforation may occur. The same danger also obtains for proctoscopy which is worthless as the diverticular openings are usually shut by swelling.

The treatment formerly was entirely surgical although medical treatment helped a great deal as is illustrated in a case. The simplest procedure is a simple colostomy which permit putting the bowel at rest and regular irrigations. In a patient a good result was obtained by this procedure. If there is a question of perforation it is usually best to await a remission. The acute symptom usually disappears rapidly. Should operation be necessary the closure of the perforation is often difficult because of the inflammatory changes in the wall of the bowel. It is often impossible to avoid tamponade and temporary colostomy. Abscesses should be simply drained. If ileus symptoms are prominent then colostomy or cecostomy must be performed. It is important to clear the findings when carcinoma is suspected. A more radical procedure is the exteriorization as described by von Mikulicz with secondary resection. The author advises against such a procedure in the acute stages. Resection should be attempted only rarely as often the entire colon is affected if it should be necessary it should be done in two stages. Transversigmoidostomy is recommended. Sudek has advised sounding of the stenosis from the colostomy opening. With this the danger of perforation is great. When repair of a fistula between the bladder and colon is made a colostomy is always necessary. Lauber reports an operative mortality of 40 per cent and Gerzonitsch reports good results in 50 per cent. (RATHGAB) WILLIAM C. BRICK M.D.

LIVER GALL BLADDER PANCREAS AND SPLEEN

Weiner H. A. and Tennant F. A. *Statistical Study of Acute Hemorrhagic Pancreatitis (Hemorrhagic Necrosis of the Pancreas)*. *Am J Sc* 1935 190 16.

A review of 4,000 necropsies at the New Haven Hospital, New Haven, Connecticut led the authors to believe that alcohol is in some way related to

acute hemorrhagic pancreatitis. All cases of hemorrhagic necrosis or acute pancreatitis not relevant to the present analysis were excluded viz (1) those associated with septicemia or systemic infection (scarlet fever, typhoid and tuberculosis) (2) those due to direct extension from a neighboring infection (peritonitis and retroperitoneal abscess) (3) those unequivocally related to severe passive congestion (usually associated with heart failure) (4) those associated with a widespread hemorrhagic tendency (purpura and leukemia) (5) those associated with carcinoma of the pancreas or neighboring structures (6) and those due to the result of direct trauma to the pancreas e.g. bullet wound. These lesions varied from pure hemorrhage to simple leucocytic invasion and from tiny focal to even the diffuse processes.

Among the 4,000 autopsies 38 (1 per cent) of the patients had succumbed to acute hemorrhagic pancreatitis and 97 (2.4 per cent) to chronic pancreatitis.

In 25 (66 per cent) of the acute cases alcohol was an associated factor. In 6 (15.8 per cent) disease of the extrahepatic biliary tract was present. Of 51 individuals dying during acute alcoholic episode 27 (53 per cent) showed pancreatic lesions (25 acute and 2 chronic). Of 41 patients with chronic alcoholism 19 (47 per cent) showed pancreatic lesions, all of a chronic nature. Of 51 with periportal cirrhosis 25 (49 per cent) had pancreatic lesions. Among 343 patients with extrahepatic disease of the biliary tract there were 6 with acute pancreatitis and 21 with chronic pancreatitis, an incidence of 1.8 and 6.1 per cent respectively.

The present material shows that the incidence of gall bladder disease is significantly increased in pancreatitis but the incidence of pancreatitis in gall bladder disease is only lightly (if at all) higher than in the general autopsy series. While the data offer no relation to the pathogenesis of acute pancreatitis they indicate at least the complexity of the problem.

The role of alcohol in the causation of acute pancreatitis is by no means clear. Isolated reports have appeared from time to time in the literature. Egzdahl in 1907 analyzed 103 cases of acute pancreatitis. His largest number (42 per cent) was associated with gall bladder disease, the next largest number (32 cases) followed gastrocolic diverticulum, of which 27 were associated with alcohol. Myers and Keefer in 1934 analyzed 9 cases of pancreatic necrosis: 22 of chronic pancreatitis and 24 of focal fat necrosis and found 12.7 and 6 respectively to be associated with either cirrhosis of the liver, fatty liver or acute and chronic alcoholism. Adam and Bouloux in 1933 reported the case of a boy aged twenty who collapsed after drinking rum and died in twenty minutes. At autopsy the sole pathological lesion was fresh hemorrhage in the pancreas.

How does alcohol act? Egzdahl is of the opinion that it was merely the cause of the gastrocolic diverticulum which in turn caused the pancreatitis. Myers and Keefer think that (1) alcohol in the blood damages the pancreas directly (2) duodenal congestion obstructs or

infects the ducts, and (3) persistent vomiting causes regurgitation of the duodenal contents into the ducts. Rich, on the basis of Gizelt's work, believed that alcohol-like food stimulated pancreatic secretion and that the pancreatitis resulted from rupture of acini, the excretory ducts of which were blocked by metaplastic epithelium.

No theory of the pathogenesis of acute pancreatitis is offered in this communication. The presence or absence, and the severity or rate of progress of the pancreatic lesion does not appear to vary with the quantity of alcohol ingested. It may attack an individual who has had little or no previous indulgence, while it may completely spare a chronic and severe alcoholic.

ELLA M. SALMONSEN

MISCELLANEOUS

Demmer, F. The Difference Between the Axillary and Rectal Temperature in Acute Inflammatory Diseases of the Abdomen (*Die axillar-rectale Temperaturdifferenz bei akut-entzündlichen Bauch-erkrankungen*) *Wien klin Wchnschr*, 1938, 1: 97.

Many cases of appendicitis do not present classical symptoms or signs. In the author's series 14 per cent of 1,400 cases were atypical. As in other diseases the determination of the difference between the axillary and rectal temperatures has been of help in the differential diagnosis of some of these cases. Normally the difference amounts to 0.5 degrees. In inflammatory diseases of the abdomen this difference increases in the course of several hours according to the author's observations made over a period of fifteen years. There is no such difference in inflammatory conditions of the chest. Although the temperatures may be within normal limits the difference between the two is the significant feature. For example, in the beginning of an acute abdominal condi-

tion, that is, during the first twenty-four to forty-eight hours the axillary and rectal temperatures may be 36.3 and 37.3 degrees, respectively. This would be an indication for urgent surgical intervention. Differences of from 0.6 to 0.7 degrees are to be regarded with suspicion. When other symptoms are lacking the temperature should be taken every three hours, and if the temperature difference is increasing the probability is that the condition is progressing. The disease may be appendicitis, cholecystitis, inflammatory or perforating gastroduodenal ulcer or pelvic inflammatory disease. Demmer especially emphasizes the importance of the sign in diseases of the appendix, which he regards as one of the most insidious of all abdominal conditions. In the presence of positive clinical symptoms the temperature difference is lacking in from only 0.5 to 0.6 per cent of the cases. The author was misled by a positive temperature difference in only 1.5 per cent, in which a febrile or grippe-like condition of the intestines was present.

The diagnostically questionable and difficult cases of acute appendicitis may be divided into 5 groups:

1. The ambulant patient with atypical and indefinite symptoms.
2. The patient with acute gastro-enteritis associated with appendicitis.
3. Paralytic ileus with or without appendicitis.
4. The combination of cholecystitis, inflamed ulcer of the stomach or duodenum, or pelvic inflammatory disease with appendicitis.
5. Patients with appendicitis who believe that the appendix was removed at a previous operation.

The author observes that frequently the patient himself is able by means of this method to detect an exacerbation of appendicitis and recognize the need for surgery. Numerous instructive histories are included to illustrate the importance of the diagnostic sign.

(FRANZ) JOHN A. GIUS, M.D.

GYNECOLOGY

UTERUS

Charrier J and Gosset J. The Indications for and Technique of Total Hysterectomy for Uterine Fibroids (Remarques sur les indications et la technique de l'hystérectomie totale pour fibromes utérins). *Presse méd* Par 1938 46 1145

In 1936 Cos et and Funck Brentano published statistics on 1 163 subtotal hysterectomies performed for uterine fibroids showing a mortality of 3.4 per cent death being the result of septic abdominal complications in 1.42 per cent and emboli in 1.25 per cent. They found that complete hysterectomy at the same institution gave a lower mortality as well as a lower incidence of serious complications (figures not cited). Go set believed that the higher incidence of complications and mortality following the subtotal operation could be reduced by a thorough clinicopathological study of the cases.

Lost mortem examinations in 2 recent cases following subtotal hysterectomy revealed streams of pus escaping from the site of peritonization. It has been definitely established that the cervical canal may and frequently does contain virulent organisms therefore the authors believe that any procedure necessitating the transverse section of the cervix introduces a source of contamination for which the usual peritonization is insufficient. As a result they have evolved what they believe to be a more favorable procedure and have used it in their last 98 consecutive cases.

The technique consists essentially of pre operative vaccination daily vaginal cleansing and the usual operative technique plus vesicorectal peritonization.

The results in these 98 cases were found to be uniformly good. Only 2 cases of mild phlebitis were observed in one of which pre operative vaccination had not been given and there were no cases with serious peritoneal accidents or deaths.

GEORGE C. FINOLA, M.D.

Bowling H H and Fricke R E. Carcinoma of the Uterine Cervix. *Am J Roent* vol 1938 40 47

The authors review the results obtained in 1 491 cases of carcinoma of the uterine cervix in which the patients were referred to the Section on Therapeutic Radiology of the Mayo Clinic from 1915 to 1939 inclusive.

The importance of suitable classification of the lesions cannot be over-estimated. The authors have classified them as follows: (1) early (operable) lesions Stage I (2) borderline lesions Stage II (3) inoperable lesion Stage III or IV (4) recurring lesions Stage I II III or IV (according to the extent of local or distant involvement) and (5) modified lesions Stage I II III or IV. Thirteen patients had early lesions Stage I 85 had borderline lesions Stage II 931 had inoperable lesion

Stage III or IV 412 had lesions which had been modified by treatment. The modified lesions represented all 4 stages of involvement.

Microscopic examination revealed epithelial areas in 880 patients adenocarcinoma in 51 and carcinoma without specification in 550. Of the 883 lesions that were graded according to Broders' classification 5 were graded 1 135 were graded 2 407 were graded 3 and 336 were graded 4.

The authors expressed the opinion that the intensive broken-dose method of radium therapy followed by a course of roentgen treatment after thorough study and planning of each individual case offers the best results in this unfortunate group of cases. In this large series extending over a period of fifteen years although the great majority of patients (91 per cent) were in an advanced stage of the disease 26.8 per cent of the entire number lived five or more years and were apparently well following treatment. The possibilities of this form of treatment for early and borderline lesions can be appreciated when it is noted that 69.2 per cent of the patients with lesions in Stage 1 were well at the end of five years and 60.2 per cent of those with borderline lesions were well at the end of five years.

This form of treatment of course requires considerable individual care and experience it also requires co-operation between the patient and the physician. The proper handling of emergencies as they arise during a course of treatment is an important factor. The fact that there is little risk to the treatment is attested by the fact that the hospital death rate for the entire series was only 1 per cent the mortalities occurring in the group with advanced lesions. There were no deaths at all during treatment in the early or borderline groups.

Dannreuther W T. Supravaginal Hysterectomy. A Review of 535 Consecutive Personal Cases. *Am J Surg* 1938 41 373

Supravaginal hysterectomy is the most popular and widely practiced method of uterine extirpation. Its selection in individual cases should depend more upon the condition of the cervix than the convenience of the operator. Extensive cervical disease malignancy and potentially malignant lesions are absolute contraindications. The vaginal surface of the portio must be completely epithelialized and the endocervical canal free from infection and inflammatory products to justify cervical retention. Many damaged cervixes can be converted to a healthy state before operation. The incidence of subsequent carcinoma of the cervix is no higher after a supravaginal hysterectomy in properly selected cases than it is in women who have never been operated upon. Adequate preoperative preparation of the patient is important. Hysterectomy can be done more rapidly with clamps than with primary liga-

tures, and the use of clamps does not predispose to postoperative embolism. When there are raw areas that cannot be satisfactorily peritonealized, sheets of gutta-percha tissue are useful to prevent visceral agglutination.

In a series of 535 consecutive personal cases the morbidity was 11 per cent and the mortality 1.7 per cent. Eliminating 1 death which was due to a diagnostic error, and 2 others which might have been obviated by an earlier appreciation of the necessity of interference to relieve intestinal obstruction, the mortality should have been 1.1 per cent.

J THORNWELL WITHERSPOON, M D

EXTERNAL GENITALIA

Hrdlička, M. The Results of the Treatment of Carcinoma of the Vulva. (Die Resultate der Behandlung des Vulvacarcinoms). *Srpski arhiv za celok lek*, 1938, 40: 238.

Between the years 1927 and 1936, 50 primary carcinomas of the vulva were treated in the first Czechoslovakian University Gynecological Clinic. The author describes the case histories in detail. The average age of the patients was fifty-nine years, the youngest patient was thirty-one years, and the oldest eighty-six years. Eight per cent of the patients were between thirty and thirty-nine years, 10 per cent between forty and forty-nine years, 20 per cent between fifty and fifty-nine years, 40 per cent between sixty and sixty-nine years, 20 per cent between seventy and seventy-nine years, and 2 per cent between eighty and eighty-six years. The patients were grouped into four divisions according to the classification of Simon. According to this classification, 1 was in the first group, 15 were in the second group, 9 in the third group, and 25 in the fourth group. In 2 a hereditary factor was described, uterus carcinoma and carcinoma of the stomach in the patient's mother. In 2 patients carcinoma developed in benign vegetations, and in 17 it followed a kraurosis. Sixteen patients had previously had pruritus without kraurosis. In 7 the cancer was on the labia minora, in 14 on the labia majora, in 8 on the clitoris, and in 1 in the posterior commissure. Histological examination revealed an unripe form of squamous-cell carcinoma in 1 patient, a moderately developed squamous-cell carcinoma in 8, and ripe forms with canceroid pearls in the remaining cases. In 1 patient a sarcoma was observed. Although this tumor differs histologically from the rest, the author is including it in the statistics as it is also a malignant tumor and is treated in the same manner. The Wassermann reaction was positive in only 1 patient. In another patient the carcinoma developed following x-ray therapy. The author does not believe that the roentgen therapy was the cause of the malignancy as Eichenberg does, but thinks that the carcinoma followed the kraurosis which the patient had had previously.

The treatment was both operative and radiation according to the local and general status of the

patient. In 17 cases a primary operation was done, and in 9 of these the radical procedure according to the method of Stoeckel-Rupprecht was done. The primary mortality was 33.3 per cent. One patient was primarily treated with radium before operation, and 2 received postoperative irradiation with the x-rays. One ten-year cure resulted without radiation therapy. The 1 patient who had been irradiated before, and the 1 who had been irradiated following operation are still living, but sufficient time has not elapsed to consider this a cure. In 3 cases the vulva was extirpated and the lymph glands were left behind. There was no primary mortality in this group. One of these patients was not irradiated postoperatively, but had a five-year cure. The second patient was treated with x-rays following the operation, and is still without recurrence. The third patient has been irradiated for recurrence, and has died.

Partial resection of the vulva was done in 1 case and followed by radium and x-ray therapy. This patient is still alive, but has not gone to the point of five-year cure. In 4 cases of carcinoma which had invaded deep into the normal tissue the carcinoma was resected and in 3 of these irradiation was done postoperatively with radium and roentgen rays in 2 cases and with roentgen rays alone in 1. One of the 2 patients (with sarcoma) and the third patient are still living, but so far no cure can be claimed. The fourth patient was not followed up. Nine patients were treated with radium first, and in 1 of these extirpation of the tumor, also of the inguinal glands, was done later. Roentgen irradiation was then given. This patient is still alive but no cure can be claimed as yet. Of the remaining 8 patients, 2 are alive, and 1 of these has a six-year cure. Seven patients were treated with roentgen rays without radium, and of these, 2 were treated surgically later. These 2 patients are still alive. Fifteen patients were treated with radium and x-rays without any operative interference. Of these 3 are still alive, 2 having a seven-year cure.

The author estimates the cure percentage of radium and x-ray therapy without surgery as about 12.5 per cent. One patient was not treated at all, because the lungs had already been invaded. Of the 50 patients, 18 are still alive, and 5 have a five-year cure. This amounts to approximately 10 per cent. The author believes that the five-year period accepted as cure is not sufficiently long, as recurrences may take place later.

(VILMA JANISCH-RASKOVIĆ) WILLIAM C. BECK, M D

MISCELLANEOUS

Kreis, J. Late Results of Treatment of Various Types of Menorrhagia or Metrorrhagia with Bismuth or Arsenic Preparations. (Résultats éloignés du traitement de ménor ou métrorrhagies, de types différents par des préparations arsenicales ou bismuthiques). *Gynécologie*, 1938, 37: 335.

A certain type of menorrhagia is attributed by the author to hereditary syphilis. It appears at

the time of puberty or during adolescence and is called puberal polymenorrhea because it is associated with other organic imperfections. The condition is always curable preferably by an iodobismuthate of quinine called Quinby.

The mechanism of hemorrhages has been elucidated by the author on the basis of the histological examination of 80 specimens. He demonstrated the existence during the menstrual interval of an insufficient regeneration of intercellular penplandular and perivascular collagen of the uterine mucosa. This insufficiency is of a congenital and constitutional character as there are no inflammatory signs; moreover, it apparently has no connection with the ovarian function because the menstrual cycle is intact. Puberal polymenorrhea may disappear spontaneously in the course of adolescence because of the constitutional maturity; on the other hand, the condition may persist for a long time in adult women or it may degenerate toward a hemorrhagic condition which does not disappear spontaneously.

In addition to the collagenous lesion of the mucosa, contributing factors such as constipation, hypertension, retroversion of the uterus and excessive coitus must be taken into consideration and an appropriate therapeutic measure may exert a beneficial effect on the intensity of the hemorrhage.

The author stresses the fact that the absence of a regular ovulation or follicular involution is not always responsible for metrorrhagia.

In some cases the beneficial effect of the aforementioned preparation may be attributed to the action on the ovaries and the author has no intention of denying this interpretation because in some cases an insufficiency of follicular maturity is a constitutional defect. However, in other cases the cyclic ovarian disturbance persists while the hemorrhage is eliminated after the use of Quinby.

Curettage is sometimes indispensable but should be preceded by an attempt to treat the uterine hemorrhages in a conservative manner. The author was using acetylarsan and bismuthodol before Quinby was introduced. The last mentioned preparation is insoluble in water and never causes any disagreeable reactions.

The beneficial effects of this preparation are illustrated in several cases. Hormonal treatment represents a substitution therapy and under certain circumstances may be not only useless but even harmful while the preparation recommended by the author never causes any untoward effects.

JOSEPH K. NARAT, M.D.

Adair F. L. Hesseltine, H. C. and Hae L. R. An Experimental Study of the Behavior of Sulfanilamide. *J. Am. M. Ass.* 1938 111, 666.

The authors herewith make a preliminary report of the results of an investigation undertaken in order to determine the efficacy of sulfanilamide therapy in gonorrhea of the female. The treatment of gynecological and obstetrical patients presented certain problems not previously encountered in the administration of the drug: viz. first, the elimination of the drug in certain body fluids (cervical secretion, menstrual fluid and human milk) and second, its transmission to and its effect on the unborn fetus. The treatment of gonorrhea with sulfanilamide was controlled by detailed studies of the blood changes, the blood level of the drug, and the urinary excretion of the drug. The criterion of cure was based on the absence of the gonococcus in both the culture and the smear. This report is based on studies of 12 patients.

After administration, sulfanilamide was found in the cervical secretion but in such a small percentage that its bacteriostatic action could be questioned. The criterion of the cure of gonorrhea should be based if possible on cultural studies as well as smears. The drug was found in menstrual blood in greater proportion than in the cervical secretions.

Sulfanilamide is excreted in breast milk both free and as the acetyl derivative. The milk level is considerably above the blood level and the drug is excreted in the milk for some time after the blood level is negligibly low. With doses of 2 and 4 gm. (30 and 60 grains) the total amount excreted was never greater than 2.5 per cent of the drug administered. It was still being excreted in small amounts seventy-two hours after the medication had been discontinued. Although other investigators have shown that young children tolerate the drug quite well, the tolerance of the newborn is unknown. Therefore it would seem safer to discontinue breast feeding during the period that sulfanilamide is present in the milk.

Sulfanilamide is transmitted to the placenta and fetus of the rabbit and is associated with a marked increase in the mortality of the young. Sulfanilamide has also been found in the placenta and cord blood of the human being.

The authors conclude further that until more is known of the tolerance of the human fetus and of the newborn for sulfanilamide, the drug should be administered only with the utmost caution during pregnancy and the period of lactation.

HERBERT F. THURSTON, M.D.

HYDATIDIFORM MOLE AND CHORIO-EPITHELIOMA

Collective Review of the Literature for the Years 1935, 1936, and 1937

ALBERT MATHIEU, M D, F A C S, Portland, Oregon

Part II

Chorio-epithelioma in the Female (Pregnancy)

CHORIO-EPITHELIOMA is a rare and malignant neoplasm which arises from the epithelium of chorionic villi, hence, it may arise at any site at which there are living chorionic cells. This growth may be associated with full-term pregnancy, abortion, extra-uterine pregnancy, hydatidiform mole, teratoma of the ovary, and teratoma of the testicle, and it may occur at any site to which chorionic villi have metastasized.

Etiology There is still a great deal of controversy among the leading authorities concerning the cause of chorio-epithelioma and its exact histological structure (24). Fortner and Owen (60) say, "The trophoblast is known to be normally an invasive type of tissue and chorionic cells are reputed to possess the property of digesting the maternal tissues. The embedding of the ovum is thought to be accomplished by the aid of this characteristic. The cells of the trophoblast are naturally endowed with great capacity for growth. Schmorl has reported trophoblastic emboli in 80 per cent of women during normal pregnancies. This parasitic tissue then is able physiologically to invade and wander. Blair Bell offers the opinion that chorionic epithelium, more particularly the syncytium, is originally of a malignant nature, although after a few weeks it comes naturally under the influence of the developing fetus and its growth is arrested at a stage where it becomes subservient to the dependent embryo. In explaining chorionepithelioma in the female it is assumed that the growth arises from a previous hydatid mole or from a placental remnant." Davis and Brunschwig (37) observe that chorio-

The comments following various topics represent the reviewer's effort to organize modern opinion on the different phases of these diseases. These expressions are based on studies of the papers of Marchand (105), Lindley (57), Vineberg (170), Caturani (25), and Szathmáry (159) (each dealing extensively with the subject or with large groups of cases through 1930) on the reviewer's five year study of hydatidiform mole and chorio-epithelioma on the Pacific coast, on the reviewer's personal experience, and on this analysis of the literature of the past three years.

Part I—Introduction, Hydatidiform Mole, and Biological Pregnancy. Tests appeared in the January issue.

epithelioma "usually follows gestation immediately or remotely. In the large majority of cases, well over 80 per cent, the pre-existing pregnancy is distinctly abnormal. In over half the cases this pregnancy resulted in a hydatidiform mole. This association between mole and chorionepithelioma is exceedingly noteworthy for few malignancies are so intimately associated with a pre-existing, relatively benign condition. The extensive proliferation of chorionic tissue in hydatidiform mole, occasionally resulting in actual invasion of the uterine wall, more than favors the similar but more extensive process seen in chorionepithelioma." Corrêa (30) maintains that the processes of invasion into the maternal tissue are similar in trophoblast and chorio-epithelioma, but in the latter the physiological processes adhere to no rule and are extremely exaggerated because of still unknown reasons.

Comment We have found in this study of the literature that practically 40 per cent of the cases of chorio-epithelioma were the direct result of hydatidiform mole. Apparently the difference of opinion as to whether this neoplasm follows mole depends on the influence of one's own statistics. Suffice it to say that living chorionic tissue in any location is potentially malignant, and that the cause of chorio-epithelioma is still unknown.

Incidence The incidence of this disease is extremely variable. Ruzicska (141) reports 0.5 per cent and Suhonen (157) from 0.05 to 3 per cent. Engelhart (49) saw 5 cases in 25,561 pregnancies. Schumann and Voegelin (145) found 1 case in 13,850 pregnancies. In many other reports, including those of Gough (72) and Manhoff (103), it is conceded that the disease is quite rare. On the other hand, Caldwell (24), Phaneuf (131), Lazard and Khman (92), Gough (72), and Mathieu (111) have each seen several cases in their own work. Suhonen (157) says that in one case the rareness of the disease was responsible for the fact that the diagnosis was missed by several physicians.

Comment The disease is relatively rare in the experience of any one man, many men of large experience having seen no case at all. However, in all probability over 1,500 cases have been reported in

the literature While chorion epithelioma is comparatively rare it is far from negligible Its relative rarity is surely one of the pitfalls of diagnosis for if one neglects to include the disease in his repertoire of diagnoses he is far less apt to make an early diagnosis than if he considers that any woman in the child bearing age might harbor malignant chorionic villi and that fully 10 per cent of moles are or eventually become malignant The most important factor toward an early diagnosis is having this disease in mind

Age and parity Manhoff (103) avers that the malignant growth takes place during the fertile age of the woman Soresi (153) notes that the disease has been reported in patients from seven to seventy years of age and that multiple pregnancy is a predisposing factor Mathieu (111) gives a ratio of 19 cases in multiparas to 9 in primiparas

Comment The age and parity are apparently only of academic interest It is obvious that the disease would take place more frequently in multiparas than in primiparas because there are a great many more multiparas than primiparas

Gross pathology Suhonen (157) speaks of chorion-epithelioma as the typical dark bleeding ulcerated tumor Gough (72) explains The uterine tumor may consist of only a few cells or it may fill the entire pelvis It is a hemorrhagic growth due to the invasion of blood vessels Both necrosis and hemorrhage thus result The lesion may lie superficially on the endometrium within the myometrium or project into the peritoneal cavity as a subserous mass Hamant Rothan and Richon (76) state The consistency of the tumor is very soft and friable its color is that of red wine sediment Caldwell (24) remarks The gross appearance of the uterine chorionepithelioma is fairly characteristic The uterus in early cases is only slightly enlarged somewhat soft and boggy the peritoneum covering uterus bladder and broad ligaments is very pale and if there are no metastases present or extension of growth into broad ligaments by continuity the whole uterus is freely movable In more advanced cases the tumor mass in uterine cavity that is attached to endometrium and infiltrating deep into the muscular wall may be palpated when the abdomen is opened by grasping the uterus with one hand The tumors resemble either wall thrombi or interstitial nodules with black thrombosed areas the base of which may partly slough away Deep seated ulcers then develop or more rarely a diffuse fungating cor-poreal type of growth With all these variations a distinctly haemorrhagic appearance with infil-

tration of the uterine wall is noted in all The tumor area is friable The growth may penetrate the uterine wall rupturing through the peritoneal coat into the peritoneal cavity Ectopic chorion epithelioma shows a tumor having no direct anatomical connection with a previous placental site The uterus may be perfectly normal or may show such hyperplasia of the mucosa and musculature as usually accompanies tubal pregnancy The site of the chorionepithelioma may be in the vagina broad ligaments or intraperitoneally The mass resembles a haematoma or collection of thrombi tumor cells being usually found only in the periphery the main mass consisting of coagulum The ectopic chorionepithelioma probably arises from a primary uterine tumor that has regressed or been expelled with a placenta or mole or from the transplanted cells of a possibly normal intra uterine placenta

Teacher (103) comments The commonest site of the primary tumour is the wall of the uterus but a considerable number of cases have been recorded in which that organ was quite sound and the primary tumour was situated in the vagina while two or three libal more than a dozen tubal and a few ovarian cases have been recorded In several cases the primary growth was interstitial i.e. it was embedded in the uterine muscle apart from and not in communication with the cavity

There may be no sign of tumour externally or a few fibrous adhesions may sometimes be found If deep ulceration or the formation of detached nodules or deep outrunners of the tumour has occurred the surface of the organ may show rounded prominences in which a dull red colour shines through the normal greyish pink of the muscle On incision the muscle contracts strongly throwing into prominence the contained growth This is a rounded solid mass composed of old firm dull red blood clot mixed with pale areas which consist of fibrin or of uterine or tumour tissue in a more or less degenerate condition The tumour presents a considerable resemblance to a fleshy mole and the histories of many cases suggest that such masses may sometimes be expelled and regarded as such If the mass be putrid as is sometimes the case it may be mistaken *in situ* for a sloughing myoma The base of the tumour is broad and covers a varying amount of the fundus and upper parts of the anterior and posterior wall of the cavity The lower part of the mass overhangs the base filling the cavity and there may be clear spaces at the sides extending up to the apertures of the Fallopian tubes Small tumours may be covered by a layer of mucous membrane like the decidua reflexa Near

the uterine muscle, the tumour presents on section a patchy red and white appearance, suggesting placental site. This zone consists of tumour masses, some actively growing, others more or less degenerate, mixed with areas of blood which simulate the uterine sinuses and are in fact frequently of this nature."

Microscopic pathology Because so little has been written on the histological interpretation of chorio-epithelioma as a subject *per se*, an extensive abstract of the writings of Benito (8) should be welcome. According to this abstract, made by Richard E. Somma, "the author is of the opinion that the histopathological interpretation of chorionepithelioma presents difficulties which are not encountered in any other type of neoplasm. Benito, in reviewing a large number of cases

found that a placental residue retained in the uterine cavity may undergo the following changes: (1) As a rule the tissue undergoes retrogressive changes without assuming malignant character. Such a tissue is called a placental inclusion. On microscopic examination one encounters nests of large, rounded, polygonal or oval cells with a finely reticulated cytoplasm. The large nucleus is placed centrally and it has a normal affinity for stain. There is no evidence of caryocentric activity in the chromatin network. As time goes on, these cellular elements undergo either mucoid or hyaline degeneration, may become calcified or, at times, may even assume an infiltrating character although the lesion remains benign. (2) In some cases the cellular elements composing the tissue may assume a proliferative, infiltrative, and highly malignant character. Metastases are rapidly formed. Under normal conditions chorionic tissue is made up essentially of two layers of cells: an outer layer composed of syncytial cells presenting round or oval nuclei and distributed irregularly within a homogeneous band of protoplasm, and a layer of large and well delimited cells which have been named Langhans' cells. The aforementioned types of cells are the only two cellular elements present which, when proliferating atypically, may suggest the presence of a chorionepithelioma. In malignancies the cellular elements of the internal layer begin to proliferate. They assume a polygonal outline because of mutual crowding. Each cell contains a large nucleus usually placed centrally and a homogeneous cytoplasm. The cells of the external layer also begin to proliferate. Their degree of polymorphism is, roughly speaking, directly proportional to the degree of malignancy of the lesion. In comparing sections taken from neoplastic tissue, endometrium, myometrium, myometrial

capillaries, and from metastases, the author encountered the same types of malignant cells presenting the same histological features, such as polymorphism and disorderly arrangement of the individual cellular elements. The diagnosis of malignancy is usually made from the aforementioned criteria supplemented by signs of caryocentric activity in the nuclei, intense proliferation, and infiltrative power independent of the site of occurrence in the various organs as well as location within the organ. In the laboratory a chorionepithelioma should always be suspected whenever chorionic cells present an atypical histological appearance. In suspected cases, the Aschheim-Zondek or any other biological test proving the presence of live chorionic tissue should be performed to confirm the diagnosis."

Other authors describe the microscopic histology as follows. Gough (72) "The pathology of chorionepithelioma is essentially an intensification or exaggeration of many of the growth processes of normal pregnancy. The normal chorion is a rapidly proliferating tissue with definite invasive qualities and a tendency to metastasize. When malignant, these functions are exaggerated, and diagnosis rests on the recognition of such hyperplasia."

Davis and Brunschwig (37) "Arising from the epithelial covering of villi the cytology of the tumor can be very variable and bizarre. The growth may be chiefly composed of large, multinucleated masses of syncytium. These masses of protoplasm are riddled with vacuoles of various sizes. The nuclei may be small, dark staining or large, clear and vesicular. There are masses of small, well-defined, polyhedral cells with large nuclei whose origin from the Langhans' cells is quite apparent. These two cellular elements vary in proportion in different tumors. Last, there are present varying numbers of intermediate cells, mononucleate and multinucleate, which have dark staining nuclei and infiltrate the tissues widely. Their origin from either layer of chorionic epithelium is not apparent, there being a marked variation in size, shape, and maturity of the cells. These component cell masses are held together by extensive hemorrhagic extravasations and necrotic tissue. The large amount of fibrin and blood is due to the peculiar ability of syncytium to invade blood vessel walls, disintegrating their continuity and leading to hemorrhagic extravasation. The extensive amount of necrosis in the tumor cells is the result of rapid proliferation of tissue without adequate blood supply. The tumor tissue is truly parasitic in that it lacks a stroma of its own and a blood supply of its own, surviving and pro-

liferating by its ability to tap the host's circulation for sustenance. Because of these characteristic tumor nodules can and probably do become completely encapsulated by necrotic tissue, fibrin, etc., thereby losing their source of blood supply and undergoing complete necrosis. This may explain the rare cases of cure in inoperable cases reported in the literature.

Oswalt and Wise (13) 'In chorionic epithelioma there is usually hyperplasia of all elements of the chorionic villi including Langhans cells and syncytium. All cells are multilayered and edema is often present. Frequently there are large numbers of fibroblasts. Embryonal cells and cells in all stages of mitosis are abundant. In the benign mole there is usually a much more orderly arrangement of the Langhans cells of the villi with the absence of embryonal cells and mitosis. Although many benign moles show a proliferation of the epithelium, the difference between this proliferation and that of the malignant mole or chorion epithelioma is usually so clear that recognition is not difficult. The papers of Caldwell (24) and Teacher (163) contain extensive and learned discussions on the microscopic pathology of chorion epithelioma.

Lewy's classification. Several authors have made use of or comments on Lewy's classification (92, 103, 111, 131). Mathieu and Palmer (112) believe that by thorough study of the pathological specimens much progress will be made in clearing up the deficiency of pathological diagnosis and that great good can be done by the use of such classifications as that of Ewing. They present an outline of Ewing's classification and illustrate it with artist's drawings. Since it is a fact that some chorion epitheliomas regress while others are extremely malignant and cause death, they hope that an effort will be made to classify these tumors with respect to their malignancy. Gough (72) says: 'Numerous attempts have been made to classify these tumors on the basis of cellular constituents but none of these classifications has clinical application although Ewing's seems best. Since both types of cells have a common origin there is no need of precise distinction. Predominance of either type of cell in a tumor cannot be relied on as an infallible criterion of malignancy. Recognition of the distortion of the normal processes not always easy is most important. Erroneous diagnoses have been made often leading either to fatal procrastination or to unnecessary sacrifice of pelvic viscera.' Caldwell (24) remarks: 'From a microscopic pathological view there are a number of subdivisions between the typical and the atypical types of this neoplasm

hence the controversy among the pathologists with reference to the diagnosis and prognosis in a given case. After an exhaustive study Ewing has attempted to base prognosis upon histology. In the humble opinion of the writer this seems logical. Ewing believes that the clinical course can be correlated with the histological structure in such a fashion as to enable the pathologist to give a definite prognosis. To the writer this seems to be asking too much of the pathologist but I do believe that a relative prognosis may be given. Ewing takes a stand rather different from that of other pathologists such as Marchand, Schlägler, Hauser, Aschoff, Frank, Hirschmann and Cristofletti who maintain that histological differentiation cannot be utilized in making a prognosis.

We conclude that the consensus of opinion that the histological criteria cannot be relied upon is fully justified with the exception that where villi are present radical operation offers excellent hope of cure and that syncytial tumors are fully as malignant as the typical varieties.

Pathological skepticism. However, there are several notes of skepticism found in the literature regarding the value of pathological examination. For example, Dickson (42) asserts that chorion epithelioma presents a problem unlike other malignant neoplasms and he quotes MacCallum as saying that the disease seems to offer an extremely interesting border line condition. He adds that chorion epithelioma of pregnancy, though one of the most malignant neoplasms known, undergoes spontaneous regression probably more frequently than any other tumor and at times there is extreme difficulty in determining the border line of malignancy. He quotes Kaufman as saying, 'The biological condition and not the histological pictures are therefore important in the true character of this tumor.'

Cross et al. (27) quoting from Zondek add to this skepticism by stating: 'The histologic differentiation of atypical syncytial reactions from true chorion epithelioma is frequently difficult and often the distinction can be made only on the basis of gonadotropic hormone studies. And Fredrikson (63) notes that one of his cases illustrates the old experience that it may be impossible to obtain a diagnosis not only on account of the difficulty of interpretation of the histological picture but also because the uterine cavity may be perfectly normal and free from tumor.'

Melot (117) discusses the difficulties of pathological diagnosis as follows: 'However, some cases of spontaneous cure are related in the literature. In general they are accepted only with the greatest reservation. Numerous anatomic pathol-

ogists, among whom is Stewart, draw attention to the difficulty and ticklishness of the histologic diagnosis. Stewart wonders if the chorio-epitheliomas cured spontaneously were not simply instances of chorioadenoma destruens, syncytial endometritis, or syncytioma. J. L. Faure and Siredey moreover point out too that from the clinical point of view as much as from the histologic point of view, there exist intermediate forms between the different tumors of fetal origin (hydatidiform mole, malignant placentoma, and placental polyp), and that it is often difficult to determine the moment when a placental polyp becomes a malignant tumor. There are times when the pathologist is forced to rely on biological tests (162).

Metastases The fact that this disease metastasizes rapidly into any part of the body offers a very interesting phase of its study and presents many difficulties of diagnosis and treatment. Clemmer and Hansmann (29) explain the rapid and multiple metastasis on the basis that "if normal chorionic villi can erode vessels and become emboli to distant organs, it is not surprising that malignant neoplastic tissue derived from placenta should progress in a similar manner. The minute metastases, some of them in vessels, described in our two cases are examples of this mechanism of dissemination. Metastasis of chorio-epithelioma by means of small emboli is probably the common method of extension to broad ligament, vagina, vulva, and lung." Manhoff (103) states, "Occasionally uterine symptoms may be absent and the first manifestation of the disease may be symptoms from metastases. They are most likely to be present in cases with involvement of the lungs and often are diagnosed as pulmonary tuberculosis on account of hemoptysis, dyspnea and pain in the chest." Cox (32) says that "the metastasis may extend to the vagina, pelvic organs, lungs, brain, liver, kidney, spleen, or bone. Many times the metastatic nodules will disappear when the mother tumor has been removed." Manz (104) relates a case in which a clinical diagnosis of pulmonary tuberculosis was made. At autopsy, extensive metastases of chorio-epithelioma were found in both lungs. Caldwell (24) thinks, "Metastatic extension may occur earlier in this than in any other form of tumor. Dissemination takes place through the blood stream and metastases have been found in almost every organ of the body. However, the lungs and vagina are the two sites of election." Melot's (117) explanation of the metastases is that "the neoplastic buds rapidly invade the uterine musculature. They penetrate into the sinuses and

proliferate. The true vascular invasion (arteries and veins) illustrates the precocity and the abundance of the metastases. The buds which proliferate within the lumen of the vessels are carried to a distance where hemorrhagic metastases in their turn arise. The most frequent are the pulmonary metastases which in the radiogram give nodular shadows at the outer layers. The hemoptysis which they cause sometimes constitutes the first symptom of the affection. Vaginal invasion is very frequent. It occurs in the form of submucous nodules, generally situated on a level with the anterior vaginal wall. It can spread and invade the urethra, the bladder, and the rectum. Cerebral metastases often occur, as well as liver, kidney, and even osseous metastases." Phaneuf (131) asserts that "metastases occur by way of the blood stream, the fetal ectodermal cells eroding and penetrating the blood vessels. These metastases are widespread, and appear soon after the establishment of the disease."

Oswalt and Wise (125) quote Pollasson and Violet, who among 445 cases found 93 with vaginal metastases, 133 with pulmonary metastases, and 40 with cerebral metastases. Several authors, among whom are Bonne (11) and Zoon (179), report the presence of metastases without a primary tumor being found in the uterus. A few authors, notably Fredrikson (63), believe that metastases can be provoked by curettage and manipulation of the uterus. Voicu and Popa (172) report "peritoneal flooding provoked by rupture of nodular metastases." Davis and Brunschwig (37) postulate that many alleged primary growths are really metastases transported from an original focus at the placental site. This original focus could have undergone complete necrosis due to the peculiar characteristics of the growth.

Corrêa (30), quoted from an abstract by Stralosch, claims that there is the possibility that "chorionic tissue can remain for years completely unnoticed in the maternal tissue and later, without recognizable reason, develop into the blastoma. Perhaps the decrease of resistance of antitryptic and antiplacental ferments play a rôle in this. Just as little can be said with certainty concerning why metastases automatically subside and disappear after the removal of the primary tumor. Attempts have been made to explain it through immunizing processes, after removal of the tumor focus so many defensive forces are said to be freed that destruction of the daughter foci is accomplished. This explanation speaks against the experiences with sarcoma, in which extirpation of the primary tumor often promotes the occurrence of previously latent metastases. The

immunizing processes have also been interpreted in another sense namely the original focus maintains the immunity while its destruction decreases the formation of means of resistance—antibodies. The observations regarding chorionepithelioma are especially surprising because of its otherwise extreme degree of malignancy.

Probably the best discussion of metastases is that by Teacher (163). The secondary tumours show a similar structure appearing on section as rounded masses of firm blood-clot at the edges of which a broken and often very scanty layer of pale tumour tissue can be seen. The vaginal tumours are globular, projecting nodules of a deep purple colour varying in size from a pea to a small apple; they have been described as thrombosed varices or haematomata. Possibly some of the recorded cases of haematomata of the vulva which refused to heal and finally caused death of the patient were actually chorionepithelioma. The most common sites of secondary tumour are the veins of the vagina and the lungs corresponding to the dissemination by the venous blood stream. The para uterine veins both at the cervix and in the broad ligament are frequently converted into large varicose thrombosed bodies which originate as extensions or metastases of the primary tumour. Secondary tumours have also been observed in nearly all the organs of the body in cases in which a general infection of the circulation has occurred. We have seen numbers of small nodules in the subcutaneous tissue of the abdominal wall. More than a dozen cases have been recorded with metastases in the brain and in several of these the only symptoms were those of apoplexy or the gradual development of coma or paralysis. The emboli from which they arise are considerable masses of tumour which have been broken off from the growing processes in the uterine vein. Sometimes they contain villi. They settle into the vaginal veins where they may attach themselves or are carried to the lungs and become impacted as emboli at the branching of an artery. The walls of the invaded vessel degenerate and dilate into varices or little aneurysms which may either undergo thrombosis or rupture and bleed profusely. Its repetition of this the nodule takes the form of a more or less globular mass principally composed of blood clot varying age.

Gough (7) states that chorionepithelioma in women has a decided tendency to metastasize through the blood stream and lesions in the vaginal wall and lung are usually the first to appear when dissemination occurs. Vaginal metastases are interesting features of this disease. This unique retrograde metastasis is attributed to

anastomoses between the uterine vessels and those of the anterior vaginal wall. Fredrikson (63) asserts that most cases in which metastases of mole or chorionepithelioma have been demonstrated, in a short time have a lethal issue, but in the literature are also described many cases in which the tumour has regressed spontaneously or following a more or less radical operation.

Comment. Metastases once they begin are rapid, terrific and ubiquitous. A part of the body is free from the invasion of metastasizing chorionepithelioma and the metastases always show the same histological structure as the original lesion. Chorionic cells have a natural power of growth but notwithstanding this quality women with normal pregnancies most of whom harbor chorionic emboli have some protection against this power of growth and do not develop malignant metastases. The rapid growth and generalization of the malignant metastatic chorionic tissue suggests either a weaker resistance on the part of the host or the absence of some element which is believed to be toxic to chorionic tissue. Perhaps the excessive amount of chorionic gonadotropic hormone sensitizes the tissues so that metastases are favored. Clinically metastases mean elapsed time that is there is a period usually of weeks or months between the beginning of the original growth and that of the metastases during which time the diagnosis can be made and early treatment instituted before metastases begin. Vaginal metastases appear to be disastrous but metastases of any degree do not preclude the value of early removal of the primary growth since often the metastases regress and disappear once the primary growth is removed. Any disease having a metastatic nature especially involving the lungs or vagina should be suspected of being chorionepithelioma.

Lutein cysts. The presence of lutein cysts of the ovaries in conjunction with this disease and that of hydatidiform mole was considerable of an enigma prior to the work of Aschheim, Zondek, Herbert M Evans and others. Before the work of the chemists there were some who considered the lutein cysts as causative factors but since the effect of chorionic gonadotropic hormone on the ovaries has been learned it is easily appreciated that in cases of chorionepithelioma there will be a constant bombardment of the hormone which will eventually hyperluteinize the ovaries. Lazard and Klimin (92) observe that chorionepithelioma is often associated with unusually large corpora lutea and unilateral or bilateral cysts of the ovaries. Garber and Young (1) speak of cystic enlargement of the ovaries about 10 times normal size. Davis and Brunschwig (3) state that the excessive hormonal influence on the ovaries often leads to a stimulation of follicle growth and excessive luteinization of these follicles. The ovaries

are often replaced by large cystic growths which consist of multiple lutein cysts. The cyst walls have characteristic yellowish color. These cystic tumors undergo rapid retrogression following the removal of the chorionic tissue, the ovaries often returning to the normal size in six or eight weeks." The ovaries of Matteace's (113) patient were found to be very large and puckered. They weighed 450 gm and their pedicles were twisted. On sectioning, they were found to contain a whitish-yellow, bloody, or gelatinous fluid. In 4 of 6 cases reported by Acosta-Sison and Galang (2) there were marked cystic changes in the ovaries. Irube and Ogura (82) observed lutein cysts about the size of a hen's eggs in the ovaries of their patient. Wood and Aguilar Pavez (176) noted multiple large cysts in 1 ovary. While Corrêa (30) did not find lutein cystic degeneration of the ovaries in his patient, he considers that these cysts are caused by overproduction of the chorionic gonadotropic hormone. He realizes that the cysts are not always present and in some cases occur only unilaterally, and while he says that the reason for this is not clear, he thinks that perhaps existing individual constitutional hormonal factors exert an influence on the condition of the ovaries. Cox (32), Gerber (68), Momigliano (119), Brews (15), and Suhonen (157) all report lutein cysts associated with chorio-epithelioma. Rust (139) cites a case in which lutein cysts were a great aid in diagnosis. Three months after the passage of a mole, he found the patient had large bilateral cysts and a small, hard uterus. There was no bleeding. When he learned that the Aschheim-Zondek test was strongly positive, he did an immediate hysterectomy, without curettage, and discovered the chorio-epithelioma. Manhoff (103) believes that the lutein cysts are due to an increased secretion of hormone from the anterior pituitary lobe and that the cysts recede after the removal of chorionic structures. Ruzicka (141) found that fluid from the lutein cysts in his cases yielded 5,000 mouse units of gonadotropic hormone per liter. Mandelstamm (102) also found that the Friedman reaction with the contents of the cysts was strongly positive. He removed the bilateral lutein cysts in his patient, and he, with others [Palmer (126), Evans et al (52)] thinks that at times a positive urine reaction is the result of an accumulation of hormones in the lutein cysts and should not be regarded as a sequela of an incretion caused by remaining chorionic tissue or an increased activity of the anterior lobe of the pituitary gland. He observed spontaneous involution of the cysts with its parallel hormone elimination in the urine and a rapid exhaustion of

the hormone elimination after the extirpation of the cysts.

Symptoms "The most important symptom of chorioneplithelioma is hemorrhage. The bleeding may first appear in the early months of pregnancy, shortly after the termination of pregnancy, whether this be normal or hydatidiform, or after a period of latency existing for months or sometimes years" (24). Caldwell (24) presents this summary of a typical case: repeated or constant uterine hemorrhage, anemia with a low degree of sepsis, enlargement of uterus, metastases, cachexia, and death. The "hemorrhage is usually profuse and may be alarming, yet, in many instances the bleeding may be comparatively slight, although protracted, simulating that which arises from retention of membranes or placental remnants" (103). Mathieu (111) in a study of 28 cases gives bleeding, nausea and vomiting, and painful uterine contractions as the outstanding symptoms. Nausea and vomiting, as symptoms, are listed by Irube and Ogura (82), Voicu and Popa (172), and others. Fever, anemia, cachexia are all factors which characterize the malignancy of chorio-epithelioma as compared to the physiological processes of nidation and placentation (30). Cachexia appears to be present in most cases, particularly when the disease has continued for some time. Gough (72) stresses pain which is variable but as a rule develops late in the disease, anemia from loss of blood, low-grade fever which is the result of bacterial invasion of the uterus, and severe sepsis which often prevents radical excision or causes death. A few authors cite albuminuria among the symptoms (82, 119). Other symptoms, either directly the result of the malignancy or coincidental, are general lassitude, edema of the legs (162), dyspnea (29, 65, 123), cough and hemoptysis (56, 63, 65, 68, 123, 157), pain in the chest and night sweats (123), bloody stools (123, 153), and backache (34, 72). The uterus is somewhat enlarged, irregular in size, and its consistency may be soft (103). However, the uterus may be of normal size, and the patient may be absolutely symptomless (112).

It appears that little attention has been paid to the breasts of women suffering from chorio-epithelioma. Manhoff's (103) patient noticed soreness of the breasts, and Nason's (123) patient developed a swelling in the right breast. The nipple and areolar region of both breasts were deeply pigmented in the patient of Wood and Aguilar Pavez (176). Benčar (7) tells of the presence of colostrum.

A few cases are mentioned in which intra-abdominal hemorrhage was responsible for the

initial symptoms (103) In these cases the tumor in its growth perforated the uterus and simulated a ruptured tubal pregnancy Mandelstamm (102) says that 18 cases of copious intra abdominal bleeding have been reported up to 1935 Pettinger (130) found the abdomen full of blood from a rupture of the anterior uterine wall through which the tumor mass was protruding Burmester (22) reports a case of intra abdominal bleeding from a pin sized perforation of the uterine wall Perforation of the uterus has also been reported by Irube and Ogura (82) Brews (15) in 2 cases Fredrikson (63) and Philipp (133) (These perforations were all due to invasion by the growth)

Diagnosis The diagnosis of this condition is made (1) from the clinical history and symptoms (2) from microscopic examination of spontaneously evacuated material, uterine curettings biopsy tissue and specimens removed at operation or autopsy (3) by means of biological pregnancy tests and (4) by the use of x rays as an adjuvant Practically all writers agree that the diagnosis of chorio epithelioma is difficult because of its bizarre nature and its biological and pathological vagaries Vague symptoms and absence of physical signs in the early stages of the disease also make diagnosis difficult Teacher (163) states

During the early stages, chorionepithelioma presents nothing that is characteristic either in symptoms or in physical signs Setting aside the hydatidiform mole cases which are in a category by themselves the clinical phenomena are those of incomplete abortion or the retention of portions of placenta often combined with those of septic infection The conditions can only be regarded as calling clearly for exploratory measures in order to establish a diagnosis Recurrent haemorrhage in association with recent pregnancy especially in women of unusual fertility and above all after hydatidiform mole abortion must be regarded as an indication for exploring the cavity of the uterus Lazard and Kisman (92) point out that hemorrhage either slight or severe after the expulsion of hydatid mole calls for a thorough investigation of the genital tract Other authors concur with these views

Diagnosis by means of curettage Diagnosis by curettage is mentioned by a great many writers—some to extol its values some to condemn it for its worthlessness and others to sound warnings either against its use or in its use Zondek (178) believes that the diagnosis is not complete unless a curettage has been done Tassovatz and Miranitch (162) Mandelstamm (102) Correa (30) Oswalt and Wise (125) and Tassovac and Mirjanich (161) are among many who have made

diagnoses by means of curettement Teacher (163) maintains that it is valuable when positive On the other hand many more authors are more or less critical in their attitude regarding the value of curettage many going so far as to condemn it because of its diagnostic pitfalls Some among which are Benzar (7) Feiner (56) Cron (34) Clemmer and Hansmann (29) Mandelstamm (102) and Schumann and Voegelin (145) were disappointed when curettage appeared to be negative in the face of actual existence of chorio-epithelioma Lazard and Kisman (92) say Diagnostic curettage is not conclusive since the small growth can easily be missed Manhoff (103) believes Diagnosis from curettings is exceedingly hazardous because the possible location of the tumor is often situated within the uterine wall and distant from the endometrium Clemmer and Hansmann (29) contend that uterine curettements have failed to reveal neoplasm Consequently the condition has been misinterpreted and therefore mismanaged Inspection of the pathologic specimen in our first case comment Mathieu and Palmer (112) proved to us conclusively that curettage could not have aided in the diagnosis in fact we would have been grossly misled by this procedure According to Feiner (56) curettage has been notoriously unsatisfactory owing to the possible location of the tumor at a distance from the endometrium Ruzicka (141) points out that in chorio-epithelioma the biological finding is especially important because one often can draw no incontestable conclusions from the curettage material Roest (137) shows the worthlessness of curettage

Warnings regarding curettage Others have sounded very definite warnings regarding curettage in the diagnosis of this disease Curettage contends Manhoff (103) increases the danger of disseminating the disease also there is a danger of perforation at the site of the friable growth Lazard and Kisman (92) say Where curettage is resorted to for diagnostic purposes serious harm may be done As Hitchman and Cristofolletti have pointed out curettage often loosens particles of the growth which are set free into the venous channels causing distant metastases Schumann and Voegelin (145) say that a third peculiarity of this neoplasm is the practical difficulty of reaching an accurate diagnosis from curetting a number of tragic errors having resulted from this fact Primary metastases may develop in direct relation to a curettage warns Fredrikson (63) Caldwell (24) writes Where chorio epithelioma is strongly suspected the writer would very emphatically advise against the use of the

curet Even in the hand of an expert, it is dangerous when used in such cases "Theoretically," says Abell (1), "curettage is a dangerous procedure in the presence of chorionepithelioma since both the Langhans' and syncytial cells are invasive in type and normally penetrate uterine tissue" Phaneuf (131) maintains that "small localized lesions may be missed by the curette" Gough (72) contends that "the blood vessel metastases urge gentleness in manipulating the uterus"

The circumscribed lesion deep in the myometrium, obviously, is inaccessible to the curette"

Warnings regarding microscopic examination of curettings The placing of too much stress on microscopic examination of the curettings in preference to the biological test has resulted in warnings regarding the examination of curettings Leroux and Isidor (95) (abstract by John S. Lockwood) state that until recently the isolated cells observed within the muscle bundles adjacent to fragments of retained placenta were thought to originate from the Langhans' layer The presence of these cells in curettage specimens has been used by some as a criterion of malignancy Clinical observation of a series of cases by authors does not confirm this belief They maintain that these isolated intramural cells actually originate from the muscle and are of maternal origin and, therefore, not invading cells They are not found normally, but only in degenerative processes The authors warn against regarding as chorionepithelioma those uterine scrapings from patients in the puerperium which may offer this picture

Choisser and Notes (27) in their analysis of microscopic examination of specimens from one of their cases explain that "the general picture was not unlike what one would expect to find in a chorionepithelioma Owing, however, to the extreme difficulty of making a positive diagnosis of such a condition from microsections alone, it was recommended that the patient be treated expectantly until the result of a gonadotropic hormone test was known The test performed two weeks after the curettage was negative The case illustrates an exaggerated syncytial reaction, which histologically was not unlike that of a chorionepithelioma The presence of Langhans' cells within the lumen of the dilated vessels made the diagnosis all the more apparent The stormy endometrial reaction was probably due to the combined effect of a low grade infection plus the trauma produced by the long continued use of a metal stem pessary The case also illustrates the importance of the gonadotropic test in the differential diagnosis of uterine scrapings when chorionepithelioma is suspected"

Teacher (163) contrasts the ease with which a diagnosis can be made microscopically from a tumor of the uterus with that of the diagnosis from curettings by saying "The diagnosis from the curettings is a very different matter The material which is removed may be only blood-clot with degenerated and dead tumour tissue The impossibility of drawing a sharp histological distinction between the villi of simple hydatidiform mole and those of chorionepithelioma or malignant mole has been insisted on Notwithstanding all this, one can hardly over-estimate the value of the histological test, although the rule that diagnosis should not be allowed to rest on microscopic evidence alone applies more strongly perhaps to chorionepithelioma than to any other tumour, on account of the fact that the features of the tumour are also those of the chorionic epithelium, both anatomically, and in respect to functional activity The danger, therefore, of mistaking conditions which are probably normal or only slightly pathological, for a malignant growth is admittedly great, but microscopic examination is the method most certain to give warning that trophoblastic elements, which are potentially tumour, still remain within the uterus Only too frequently in the history of cases the statement is found that portions of retained placenta were removed and thrown away without being submitted to microscopic examination Then, after weeks or months, when the clinical signs had become so urgent that hardly a doubt remained, the diagnosis was established by this means, but too late"

A few authors report cases that were diagnosed purely by clinical sequence [Brews (15), Irube and Ogura (82), Stoeckl (156), Phaneuf (131)] Many diagnoses were made by biopsy of metastatic nodules and masses evacuated by the uterus Among these reports were those of Clemmer and Hansmann (29), Cron (34), Brews (15), Melot (117), Mandelstamm (102) Ladreyt and Drugman (91) report a biopsy of a uterine tumor which showed adenocarcinoma A study of the specimen after removal of the uterus showed a definite chorio-epithelioma in addition to the adenocarcinoma Other authors [Hamant, Rothan, and Richon (76), Voicu and Popa (172), Violet (171), Soresi (153), Burmester (22)] report cases in which the diagnosis was not made until after laparotomy Still other authors report diagnoses of chorio-epithelioma which were not made until autopsy—Pettinger (130), Benčar (7), Gerber (68), and Brews (15), who reports 3 such cases

Comment Immediate frozen-section microscopic examination of nodules or metastases may occasionally clear up the diagnosis and aid in the cure

Sedimentation rate in diagnosis The sedimentation rate may be slightly (112) or greatly increased (98 153 155 157) Oswalt and Wise (15) made several sedimentation readings which showed an increase on all occasions.

Comment The sedimentation test should be used more than it has been used. It is a very definite diagnostic sign of destruction of tissue and the sedimentation rate is probably always found to be increased in cases of chorio-epithelioma. The greater the extent of the disease or the greater the necrosis the more rapid the sedimentation rate.

Stressing early diagnosis It seems to be generally agreed that early diagnosis usually means cure. Engelhart (40) reports 5 cases of chorio-epithelioma which he observed in the last ten years. The saving of these patients he ascribes to early diagnosis and prompt operation. Acosta Sison and Galang (2) report 6 cases of chorio-epithelioma 4 preceded by mole. All the patients were cured by early operation. Digonnet and Verne (43) Kust (130), Viking (100) Roe (137) and Steigelmann (155) are among those who made use of all modern criteria operated immediately and saved their patients. Mathieu and Palmer (112) have written a paper on chorio-epithelioma with early diagnosis as the main theme. They believe that since the advent of the biological pregnancy test diagnosis of chorio-epithelioma can be made usually before metastases take place and a cure obtained by early operation. Lazard and Kliman (92) stress the importance of early diagnosis and prompt radical treatment. Along this same trend Gough (72) says that in no other disease is prognosis dependent so much on early recognition and early treatment. Hamant, Rothman and Richon (76) and Lazarus Barlow (94) are of the same impression. Koehler (87) did a total hysterectomy without diagnostic curettage simply on the basis of a positive pregnancy test which had persisted for sixty-eight days after removal of a mole and cured his patient.

Comment In this review it was almost invariably true that when the patient was operated upon early she was cured and that death almost invariably resulted in that group of cases in which the disease was of more or less long standing.

Diagnosis by biological pregnancy test The biological pregnancy tests figure conspicuously in the diagnosis of this disease. Because the subject of these tests is so closely related to both hydatidiform mole and chorio-epithelioma we have grouped the data regarding these tests in both diseases under one heading so as to avoid overlapping and unnecessary repetition. (See discus-

sion of Biological Pregnancy Tests in Part I of this review.)

Comment As will be seen in the review of modern treatment the diagnosis and particularly early diagnosis is by far the greatest factor in the cure of chorio-epithelioma. Primarily one must be conscious of this lesion as one which might be associated with any pregnancy mole or abortion and especially pathological pregnancy. The clinical history should be followed carefully. An expert histological examination of all curettings molar tissues metastatic nodules and removed specimens should be made. An intelligent and judicious use of biological pregnancy tests must be pursued. Errors in the evaluation of the histological examination of curetting and in the interpretation of the pregnancy tests can easily be made. In many cases curettage would be of no value because the lesion is intramural and cannot be reached by the curette.

If I can gather evidence correctly it appears that many mistakes of diagnosis are made in connection with chorio-epithelioma. In the first place it seems that the disease is not suspected soon enough and then too much time is lost before arrival at a diagnosis and institution of prompt and proper treatment. One can feel by reading contemporary literature that in most cases in which death occurred there was a definite element of uncertainty or delay in the diagnosis and treatment. On the other hand there is abundant confirmation of the fact that early diagnosis and hysterectomy gave the maximum of cure.

Bizarre cases Many bizarre cases of chorio-epithelioma are reported and some of these are of extreme interest. Some others are irreconcilable with known facts.

Lull (99) describes a case in which the uterus was removed three months after a normal pregnancy and birth because of a persistently positive Friedman test with a dilution of 1 to 20. A small chorio-epithelioma was found. The patient died two months later. This case represents one of the few reported in which diagnosis and operation were made comparatively early without cure.

The first evidence in Suhonen's (157) case was a dark pustule in the vagina. At first this patient was treated as having syphilis. Later because of involvement of the cervix the uterus and both tubes were extirpated and a large chorio-epithelioma was found in the uterus. This patient died.

On the fourteenth day following the expulsion of a mole curettage was done for bleeding with the histological diagnosis of chorio-epithelioma in the case of Tasovac and Mirjanic (161). The Aschheim Zondek reaction was negative on the following day and after six months the patient was entirely well.

Feitner's (56) case is unexplainable and he counts the occurrence in a woman aged twenty

eight years, of a vaginal tumor possessing the histological structure of a malignant chorio-epithelioma two and a half years after the last demonstrable pregnancy. He "regretted that the Aschheim-Zondek test was not utilized earlier in the course of this case, in which event a prompt hysterectomy might have stayed the progress of the disease" (There may have been an intervening unrecognized pregnancy).

Remzi and Erez (135) report the case of a woman of twenty-five years who developed a typical chorio-epithelioma following expulsion of a mole. The Aschheim-Zondek test was strongly positive. The uterus, following the expulsion of the mole, increased in size, but because it was inaccessibly buried in matted adhesions it could not be removed. Three months and eighteen months later there was no evidence of uterine tumor. The Aschheim-Zondek test and diagnostic curettage were negative. The authors report this case as a spontaneous cure of chorio-epithelioma, but the abstractor says the accompanying microphotograph is not convincing.

Also unconvincing is the case of Ladreyt and Drugman (91). They report that a woman sixty-three years old, not yet past the menopause, complained of excessive bleeding. When biopsy disclosed an adenocarcinoma, hysterectomy was performed. Study of the specimen showed a small but definite chorio-epithelioma in addition to the carcinoma. No hormone studies were attempted. The abstractor states that the authors present drawings of chorionic villi which were found, although there was nothing in the history to suggest a pregnancy during the previous nineteen years.

Comment. I should place this case report in the irreconcilable group. There are some cases of chorio-epithelioma which appear paradoxical, and there are also some case reports which have the same appearance.

Cron (34) makes a very interesting report of a patient who harbored a small cystic tumor in the right broad ligament. Curettage revealed only atrophic endometrium. A mass developed in the right vaginal wall which appeared slightly bluish and vascular. After this mass was excised there was considerable bleeding, and a second biopsy obtained at this time revealed a typical malignant chorionoma. The Friedman test (dilution 1 to 10) was markedly positive at this time. Following the second operation the patient developed septicemia. There was more hemorrhage and finally death. At autopsy the uterus, ovaries, and tubes were normal except for a small follicular cyst in the right ovary. A mass, the size of a baseball, in the

right broad ligament, showed no tumor cells on microscopic examination. Cron cannot explain the fact that only 1 ovary in each of 2 different rabbits showed hemorrhagic follicles. (In our last 400 Friedman tests, there were 19 in which only 1 ovary of the rabbit was affected.) A very interesting feature of the case was the absence of involvement of the pelvic organs by the tumor, and it was not until tumor cells were found in the blood vessels of the lung that Cron (34) was sure of the correct diagnosis. (This case is truly bizarre.)

Elliot (48) performed a total hysterectomy on a woman one month after a living child was delivered by cesarean section. The uterus showed chorio-epithelioma. The mother was cured.

Brews (15) reports a case of chorio-epithelioma of the cervix. Momigliano (119) records a case of primary cervical chorio-epithelioma, and mentions two possibilities of formation: formation from a true cervical pregnancy, and formation from normal or pathological elements which had entered the wall of the cervical canal. He refers to 33 cases of probable primary cervical chorio-epithelioma recorded in the literature and describes 9. Ruzicka (141) also reports a case of intracervical chorio-epithelioma after digital removal of a mole. The patient died.

The writings of Okazaki (124), Gerber (68), Manhoff (103), Maczewski (101), Fujimori and Kobayashi (65), Soresi (153), and Nason (123) contain reports of bizarre cases.

Ectopic chorio-epithelioma. Certain investigators think that extra-uterine, or ectopic chorio-epithelioma may appear in various organs without any primary growth being found in the placenta, and that this type of growth represents metastases from an unrecognized or healed placental tumor. However, the ectopic lesion may spring from normal cells of the chorionic epithelium which gain access to the blood stream during and after pregnancy and finally settle down to proliferate in the different organs and tissues. Soresi (153) and Mandelstamm (102) each report a case of intestinal involvement by ectopic chorio-epithelioma which gave signs of intra-abdominal bleeding. Benčar (7) reports a case in which the tumor perforated the small bowel. He says that these metastases no doubt were the direct result of a bursting tubal pregnancy. Philipp (133) records an ectopic chorio-epithelioma in the cul-de-sac, and ectopic chorio-epithelioma developing in the cul-de-sac was seen by Fujimori and Kobayashi (65). Brews (15) reports a primary chorio-epithelioma of the rectovaginal septum and presacral tissues, and another case in which there were

multiple deposits of chorio-epithelioma of the liver and other organs with no definite primary focus to be found in the genital tract

De los Santos (40) classified his case as extra uterine chorio epithelioma with metastases to the vagina lungs and liver. He made the diagnosis of primary chorio epithelioma in the retro-uterine tissues because of (a) absence of primary uterine tumor in the presence of decidual reaction in the uterus (b) the considerable size of the retro-uterine growth with metastases having typical chorio-epitheliomatous elements histologically and (c) the absence of teratomatous structures grossly and microscopically.

Bonne (11) reports a case of a woman who died suddenly. Autopsy revealed extensive cerebral hemorrhage renal infarcts and a tumor nodule in one lung which was a chorio-epithelioma. A most minute search failed to demonstrate a primary tumor in the uterus or adnexa. Bonne thinks that either the primary uterine tumor was cured spontaneously or else the lung tumor was the result of malignant change in a metastasis of normal chorionic tissue.

Gonnermanns (10) patient died without a diagnosis apparently from extensive metastasis. A growth the size of a walnut was found on the left kidney. While the ovaries and uterus were normal he believes that there must have been a primary tumor of the uterus. Wood and Aguilar Pavéz (176) describe a case of ectopic chorio-epithelioma resulting from tubal pregnancy. The Friedman test was positive. The patient died after operation.

Comment. It is obvious that some cases of teratomatous growths will harbor chorionic villi and hence may develop chorio epithelioma. It is equally obvious that ovarian pregnancy abdominal pregnancy or tubal pregnancy might terminate in chorio epithelioma. We cannot assume however that chorio epithelioma can just pring out of the air and for this reason all other cases of ectopic chorio-epithelioma must be regarded as being caused by metastases of chorionic villi from a pregnancy.

Operative treatment. Practically all authors agree that once the diagnosis of chorio-epithelioma has been made the proper treatment is immediate hysterectomy. All agree that early operation offers the highest incidence of cure. Thus Van Hoff (103) says "The treatment of chorio-epithelioma is by resection." Hamant, Rothan and Richon (76) Cox (32) and Lazard and Khman (92) advise early hysterectomy. Once the diagnosis is made Clemmer and Hansmann (20) state "Clinical symptom suggesting chorionepithelioma together with a strongly positive Aschheim

Zondek reaction or Friedman test yet no evidence whatever of placenta or placental neoplasm in uterine curettements should indicate surgical exploration. Such a procedure may often result in the early diagnosis and adequate treatment of an intramural newgrowth of placental origin. Schumann and Voegelin (145) are firm believers in radical surgery and think that "the commonly accepted plan is to perform an extensive pan-hysterectomy with removal of both tubes and ovaries."

Gough (72) maintains that when chorion epithelioma has been diagnosed prompt complete excision of the tissues involved is the ideal treatment. Anemia should be combated by transfusion before the operation. Abdominal hysterectomy is the operation of choice permitting better exposure the ligation of vessels before clamping and cutting and the removal of the uterus with the least trauma as well as assuring better hemostasis. The lutein cysts of the ovaries due to the disease and have no causative significance hence removal or conservation of the ovaries is optional. The excision of tissue containing malignant cells however would naturally take precedence over the conservation of ovarian function. The cervix should of course be removed.

Phaneuf (131) points out that "the treatment of this highly malignant disorder must be instituted early if curative results are to be expected. Fortunately with the Aschheim Zondek test and its modifications and with the quantitative assay of the urine for the gonadotropic hormone a much earlier diagnosis can be established than has heretofore been possible. The prophylaxis rests upon the complete evacuation of every vesicular mole by curettage or preferably under direct vision as recommended by Schumann followed by immediate hysterectomy with the ablation of the tubes and ovaries if invasive areas in the uterine musculature are encountered. This method should improve results in the future. The cure of chorionepithelioma rests upon a panhysterectomy, the removal of the adnexa and the excision of veins and glandular structures which are susceptible to extirpation."

Caldwell (24) believes that "as soon as a positive diagnosis is made a complete abdominal panhysterectomy is indicated. In early cases where the ovaries are normal one ovary may be left to continue the ovarian function without danger of metastases. In young women where a positive diagnosis of chorionepithelioma is made and there is an element of doubt the patient should be prepared for radical operation but when the abdomen is opened the surgeon with

the situation in perfect control, may do an hysterotomy safely, thus being absolutely sure of the diagnosis. If there should be an error in diagnosis the uterus is closed and no harm is done. If the diagnosis is confirmed by the hysterotomy a pan-hysterectomy is performed at once. In all such cases where the diagnosis is made early and the growth is confined to the endometrium and the musculature of the uterus, the prognosis is good, if the proper operation and treatment is carried out."

Relative to operation, Teacher (163) drew the following practical conclusions: "(1) that in some cases it is probably safer not to strive too much for complete removal of venous extensions, (2) that no patient who appears to be at all capable of standing it need be refused operation on account of the presence of secondary growths, and (3) that owing to the absence of local infiltration, and particularly the absence of lymphatic infiltration, the Wertheim operation is not necessary."

Melot (117), who has written rather extensively on the varied treatments of this disease, notes that up to the present time nearly all the treatment has been surgical, but he advises that an extensive hysterectomy, such as the Wertheim, need not be done because the neoplastic invasion takes place rapidly and at a distance by way of the blood and not by the lymphatics. He says that statistics show that the operative mortality is great because of the poor general condition of the patients, who are anemic and toxic and resist operative shock poorly. He believes that the patients should be well prepared for operation. However, he warns that surgical interference seems to promote the appearance of metastases, and he gives adequate evidence against the use of the curette. While he believes in the value of curettage for diagnosis, he says that immediate hysterectomy should be done if the result of the curettage is positive.

Several authors [Clemmer and Hansmann (29), Lazard and Kliman (92), Schumann and Voegelin (145), Gough (72), Manhoff (103), Mathieu and Palmer (112), and others] offer definite evidence that in certain cases the curette is absolutely valueless. Clemmer and Hansmann (29) review 2 cases "indicating the inherent possibilities of error in diagnosis and resultant mismanagement with the hope that subsequent similar situations will be approached more intelligently," a rather severe criticism of the use of the curette in diagnosis or treatment of this lesion.

X-ray and radium treatment. Treatment with x-ray and radium is beginning to appear in the literature, and Nason (123) says that "both

hydatidiform mole and chorionepithelioma succumb readily to radiotherapy and x-ray due to the highly embryonic and anaplastic character." Phaneuf (131) thinks the same. Manhoff (103) believes that if the case is inoperable or a very poor risk, radium and deep x-ray should be employed.

Melot (117) takes up the question of irradiation both with gamma and x-rays. "Treatment by radiation has for a long time been applied only in hopeless, inoperable cases, in those cases in which it was not possible to complete the intervention, or in those cases in which there was recurrence after the intervention. Under these conditions, the treatment is employed solely in the gravest cases. This increases the radiotherapy statistics. We know the elective sensitivity of embryonic tissue to radiation, and it is justifiable to expect a great sensitivity on the part of a malignant tumor of fetal origin. Wintz asserts that chorionic cells are 40 to 50 times more sensitive than the cells of the uterine mucous membrane."

Gough (72) finds that "there are relatively few reports in English of primary irradiation in the treatment of chorionepithelioma, its use being restricted largely to inoperable cases or to those with metastases." He quotes the results of several workers, and says, "Certainly in the inoperable patient and when the surgical risk is great, irradiation has proved valuable. Further experience may justify the extension of this form of treatment." Spitzer (154) points out that surgical manipulations might lead to metastases of chorionepithelioma, and that consequently radiological therapy has been recommended by many authors. He rather bemoans the fact that studies on the gonadotropic-hormone content have been made mostly following surgical removal of the growth and not following radiological treatment. He reports a cure with radiological treatment.

Davis and Brunschwig (37) think that too few cases are seen in any one clinic to allow the development of a standard therapy, and they have long been of the opinion that "chorionepithelioma should rank among the most radiosensitive neoplasms because of its rapid growth and embryonic cell type." In a very excellent paper, entitled "The Roentgenotherapy of Chorionepithelioma," they detail a case in which placenta previa accreta was considered in the diagnosis, but which ultimately proved to be one of chorionepithelioma. They operated on the patient to control hemorrhage and "in amputating the corpus it was necessary to cut across tumor tissue which had replaced most of the cervix and parametria, particularly on the right side. Histologic section from the growth

left behind in the cervix and parametria showed the invasive chorionic epithelium. (One of my cases was like this but the Friedman test was negative on the sixth postoperative day. The patient was cured.) Because of the wide extent of the growth radiological treatment was started about ten days postoperatively and the patient was cured eventually. In conclusion these authors add: The treatment of this case was so satisfactory that radiation therapy should be considered in every case of chorionepithelioma. In operable cases where the entire growth can be removed easily operation is probably the method of choice. However it should be preceded or followed by a thorough course of radiation. In the inoperable case or for the treatment of metastatic growth adequate radiation offers the best prognosis. It must be remembered that when radiation is resorted to it must be pushed to the limit of tolerance of the patient.

Stoeckl (156) reports a case in which heavy x ray and radium treatment was given with improvement in the patient's general condition, notwithstanding that the hormone test was still positive. The patient developed lung and brain metastases. Maczewski (101) reports 2 cases of chorio-epithelioma in which x ray was used. In the first, the neoplasm developed in the face of irradiation and the patient died of pyemia. The second patient was treated with radium and x ray for two years and as the Aschheim Zondek test was still positive the uterus was amputated. It was found that the chorio-epithelioma had grown through the uterine wall and extended into the folds of the broad ligament. Notwithstanding the fact that the patient was well one year after this operation the Aschheim Zondek test was still positive and at the time of his report while the patient seemed well and healthy there still was a positive pregnancy test. He believes that the long duration of the illness permits one to suppose that the developing power of the chorio-epithelioma was arrested by the x ray irradiation and for that reason the illness progressed so mildly. Ruzicka (141) Mathieu (111) Lazard and Kliman (92) Cox (32) and Mandelstamm (102) all believe that x rays should be used either preoperatively or postoperatively when there are metastases. Acosta Sison and Galang (2) are rather discouraged with x ray treatments. They think the treatment should be hysterectomy and postoperative irradiation. (While treatment with x rays seems to be well founded theoretically these reports are not very promising.)

Cox (32) and Phaneuf (131) are among those who mention radium inserted into the uterus.

Melot (117) states that radium appears to have been reserved for metastases well localized and easily accessible particularly for vaginal recurrences. Cures have been obtained after the application of doses ranging from 940 (Jung) to 3940 milligram hours of radium element (Schummel). Mathieu and Palmer (112) condemn the promiscuous use of radium in uterine bleeding at the cost of keen and finished diagnosis.

Lytic substance in treatment. There is a suggestion in the literature that the use of some lytic substance might possibly be evolved as a cure. Sensing the possibility and hoping that the ultimate treatment of chorio-epithelioma will be by means of some lytic substance obtained probably from the postpartum woman Fortner and Owen (60) find that support for this theory exists in the work of Fraenkel who demonstrated that the serum of normal pregnant women is lytic to chorionic epithelium while the serum of women with chorionepithelioma lacks this property. There is a possibility that treatment of these tumors may eventually be non surgical consisting in serum injections or endocrine therapy. In view of the observations made by Fraenkel it would seem that serum from pregnant animals holds promise of being beneficial. Such sera are now being utilized but it is too early to expect accurate findings although results in chorionepithelioma in the female should be reported at an early date. William T. Black (9) remarks: There is evidently present during normal pregnancy antibodies or some lytic substance that takes care of these cells. However as Blair Bell and others have taught there is under certain circumstances after death of the fetus and under other conditions a loss of resistance and these embryonic cells grow locally and metastasize rapidly to other organs. Manhoff (103) comments: If malignant changes are permitted to occur due to the absence of some lytic substance in the mother's blood then theoretically giving the blood of a pregnant woman would be indicated as a curative agent in the treatment of chorio-epithelioma.

Dickson (42) in a most interesting paper suggests that serum from the female in the puerperium and pregnancy be given a therapeutic trial in the treatment of chorio-epithelioma. He argues that the conception that chorionic epithelium per se is malignant seems reasonable. It is not unreasonable to postulate that having been exposed normally through the ages to the possibility of malignant growth of chorionic epithelium woman possesses an inherent capacity to combat such a development that given the presence of this epithelium the absence or occurrence of it

lignancy is determined solely by the presence or absence of a capacity for defense by the host." Dickson (42) adds that "the idea of a hormone or antibody control of normal chorionic epithelium is not new," and he quotes MacCallum, Fleischmann, Kaufman, and Schmauch as authorities for his belief that "serum from the female in the puerperium and possibly also in the latter part of pregnancy when administered to one suffering with chorio-epithelioma might exert a retarding influence on the process." He recommends that selected hopeless cases of chorio-epithelioma be treated by the intravenous administration of large doses of serum from the human female at various stages of the puerperium and the later stages of pregnancy. If the reaction should be favorable, he would advise the use of serum from one of the lower animals, such as the mare.

Comment The consensus of opinion appears to be that early diagnosis and immediate hysterectomy offer the best chance of cure. The choice of total hysterectomy or that of subtotal hysterectomy should depend on whether or not the cervix is involved or whether or not it is expedient to remove it for other causes. Since no one can determine the time when a primary growth gives rise to metastases, it is obvious that the sooner the treatment is instituted following diagnosis the better it is for the patient.

Removal of the ovaries should depend entirely on whether or not they are involved either by a primary growth or by metastases. The mere presence of lutein cysts, which so often accompany this condition, is no indication for the removal of the ovaries, for when the primary growth is removed the lutein cysts slowly but surely regress and the ovaries return to their normal condition. The fact that the ovaries need not be removed has been proved by many authors, and there is no doubt that in the future a woman need not be castrated simply because her uterus is the seat of a chorio-epithelioma. Except in primary chorio-epithelioma of the ovary, chorio-epithelioma of the ovary associated with teratoma, and metastases in the ovaries from a primary tumor in the uterus, the ovaries are not involved in this disease sufficiently to warrant their removal. Only a few workers have had the courage of their convictions and the pioneering spirit to remove the uterus and leave the ovaries in young women. These few have been paid for their courage with no loss to the women.

It is also generally conceded that in most cases the removal of the primary growth results in retrogression of the metastases. While this result does not always take place, the presence of extensive metastases need not delay the operation. Blood transfusions are almost unanimously used as adjuvants, not only in preparing patients for operation, but also in sustaining them following operation. A few contributors believe that since chorionic tissue

is by its nature extremely susceptible to irradiation, this form of therapy should be used more extensively. However, facts at hand at the present time do not warrant this conclusion because hysterectomy shows the better results.

It would also seem, from a study of the literature, that there is a strong feeling against curettage, in as much as it is liable to disseminate the lesion or cause perforation of the uterus, and since, also, it may be extremely misleading and cause mismanagement of the case when the lesion is buried deep in the myometrium and is inaccessible to the curette. A great deal of this argument can be applied to hysterotomy as treatment of this lesion. In the days of Vineberg, who really made an advance in the treatment of chorio-epithelioma and hydatidiform mole by introducing the maneuver of "vaginal hysterotomy," there was a reasonable excuse for its performance since the biological pregnancy tests were not available. However, at the present time the pregnancy tests can do much more for us than hysterotomy, and since they are subject to fewer pitfalls and errors in diagnosis that might cause mismanagement, it seems expedient to condemn hysterotomy as a treatment of chorio-epithelioma. What is more, since many of the lesions are intramural and small, it would be quite impossible to visualize or even to palpate them. In 3 cases that I have seen these lesions were sufficiently small and sufficiently soft so that actual palpation of the uterine wall did not reveal them. If one thinks of palpation of the uterine wall in an attempt to locate such a lesion, with one finger in the uterus and the other on the abdominal wall, one could easily see how impractical this procedure is when done vaginally. And a more serious error could be made if one made the hysterotomy sufficiently extensive so that the uterus was actually delivered into the vagina. This operation, of course, would be infinitely more formidable in the primiparous woman than in the multiparous woman. Almost the same could be said for hysterotomy through the abdominal route. The hysterotomy incision, of course, would be made in the midline of the uterus. It would reveal only growths within the uterus, which could easily have been shown by a gentle curettage, or it would show a lesion at a site involved in the incision. It would not reveal lesions in other parts of the uterus. And since small intramural lesions have been reported on numerous occasions, one can see the tragedy of depending on hysterotomy in the diagnosis. Again, I repeat that I have seen 3 such cases in which the results would have been tragic had I depended on hysterotomy.

Since hysterectomy is the operation that cures, it seems best that we abandon curettage and not take up hysterotomy. While abandonment of curettage might seem extremely radical, when we estimate the rare good it does, the harm it causes (dissemination, delay, rupture of the uterus, wrong diagnosis and mismanagement), and the better information, we can get through biological pregnancy tests, it does seem advisable that curettage be abandoned.

entirely. Just as in acute appendicitis and ectopic pregnancy all patients should be operated upon as soon as the diagnosis is made in order to obtain the best results and serve the common good. In a few cases in the literature it appeared that the uterus had been removed needlessly but these cases are rarities and need have no effect in controlling our conduct. Surgeons who attach too much importance to the loss of the uterus are apt to neglect the common good. While there is occasionally an argument from a pathologist that certain lesions of chorio epithelioma might have regressed and thereby hysterectomy have been prevented I do not believe that we should let the occasional negative pregnancy test or the occasional instance of regression both of which are rarities dominate the situation. I am sure that waiting for regression of the chorio epitheliomatous lesion does not constitute one of the factors responsible for the lowered mortality rate obtained at the present time. In this study of the literature it was almost invariably found to be true that when the disease was diagnosed early and hysterectomy performed immediately the patient was cured and that on the other hand the deaths were recorded almost invariably among the cases in which there was either delay in diagnosis and treatment or in which the disease was of long standing.

May I be forgiven if I say that at the present time one of the deterrents in the advance of progress regarding diagnosis and treatment and hence cure of this disease is slipshod reporting. Editors should refuse papers on such a controversial subject unless these papers show all the earmarks representative of thorough and complete scientific study and honesty of purpose. The highest percentage of cures will be obtained when there is judicious correlation of the clinical history, verified histological examinations and intelligent interpretations of the biological pregnancy tests. It would appear that if modern criteria are used early diagnosis is made and early treatment instituted the women with chorio epithelioma will have a chance to get well in approximately 95 per cent of the case and keep their ovaries.

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OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Solomons, B. Tubal Pregnancy. *J Obst & Gynaec Brit Emp*, 1938, 45, 644

This article is a discussion by the author based on a personal observation of 241 cases of tubal pregnancy. Ovarian and abdominal pregnancies are not included. He has classified his cases into 4 interstitial pregnancies, 141 isthmal pregnancies, 38 ampullary pregnancies, and 31 tubal abortions.

He holds no particular brief for any of the various theories as to the cause of this condition. He does believe, however, that tubal endometrial implants may be the cause in some cases. In other cases it is possible that changes in the rhythmic contractions of the tube due to some fault in menstrual function may be a factor.

In discussing the diagnosis of this condition the author stresses the point that a large proportion of the cases of tubal pregnancy do not correspond to the customary description given in textbooks. Many patients do not give the history of missing a period followed two or three weeks later by intermittent vaginal bleeding and abdominal cramps. Seventeen of his patients had had complete amenorrhea and had given symptoms suggestive of intestinal obstruction. Also, instead of the usually stated period of six weeks of amenorrhea preceding the symptoms, there is frequently a period of from two to four months of amenorrhea before clinical signs are manifest.

The vaginal examination is often inconclusive. Tenderness is usually present but often no mass is palpable even with examination under anesthesia. The author has never seen Cullen's umbilical sign and does not believe that shoulder pain or tenderness on movement of the cervix is of any particular value in the diagnosis. The Aschheim-Zondek test is of value in differentiating tubal pregnancies from inflammatory conditions, but the urobilinogen test is of no diagnostic assistance. Klapfen's sign and the sedimentation rate are also probably not dependable.

Exploration of the cul-de-sac is a certain and definite help in the diagnosis. It should always be done in doubtful cases, and there is no danger in this procedure when it is carried out with care.

The treatment of choice in unruptured tubal pregnancies is operative. Occasionally it is not necessary to do a salpingectomy, and a salpingotomy suffices. The author has been able to demonstrate by subsequent hysterosalpingography that the tube remains patent.

The treatment of ruptured tubal pregnancy is an immediate operation. This should be done even if the patient is in shock. The intravenous administration of saline, coffee enemas, or the submammary administration of saline is indicated during and after the operation. The blood should not be removed

from the abdominal cavity, and it is often good if a pint of saline is poured into the peritoneal cavity before it is closed. The author has not given a blood transfusion to any of the patients of this series and sounds a warning "against indiscriminate blood transfusions."

There were no fatalities in the author's 214 cases. He was able to follow up 158 of the patients. None had any complaints other than vague abdominal discomforts. One hundred and eighteen of the patients had subsequent pregnancies. Eighteen of the 40 sterile patients were examined. Ten of these had closed tubes, and salpingostomies were done. Two of these patients became pregnant. Eight patients had apparently normal tubes and "simple dilatation and insufflation with carbon dioxide brought about pregnancy in 4 instances."

RONALD R. GREENE, M.D.

Ärvar, A. von. Hormonal Causes of Prolonged Gestation (Ueber die hormonalen Ursachen der Uebertragung). *Zentralbl f Gynäk*, 1937, p. 2900.

Each of 4 pregnant rabbits was given 2 K units of corpus-luteum hormone (proluton or glanducorpin) daily, beginning on the twenty-fourth day of gestation, and all 4 had a litter of young between the thirtieth and thirty-third days. The hormonal treatment, consequently, had effected but one or two days' prolonged gestation. As a contrast to this experiment, 3 pregnant rabbits were given daily injections of 40 units of luteoantin (gonadotropic hormone of gestation serum) from the fifteenth to the twentieth day of gestation, with a consequent decidedly successful prolongation of the gestational period. Laparotomies between the fiftieth and the fifty-seventh days yielded dead fetuses (a prolongation of from twenty to twenty-seven days). Another 3 pregnant rabbits were given daily doses of 10 ccm of gestation-serum (obtained from three to four months' follicle hormones), beginning the twenty-fourth day of gestation. All of these animals had prolonged gestational periods. The laparotomies, between the forty-fifth and sixty-first days, yielded dead fetuses. Similar results were obtained by the use of gestation urine in place of gestation serum. To prove that the prolongation was not the result of newly formed corpora lutea, the following experiments were conducted.

One pregnant animal was given a daily dose of 100 units of luteoantin, from the sixteenth to the twenty-first day after conception. The litter of its living young followed at term.

The injection of gestation serum at the end of term (at the moment when the animal begins to pull out its hair) prevented labor pains in one rabbit.

The best proof of the author's assertion that the gonadotropic hormone, and not the corpus luteum, is responsible for the prolongation of gestation

would have been a continuation of the pregnancy after the injection of gestation serum despite the operative removal of the corpus luteum. However these experiments failed as operative procedures even the mere inspection of the ovaries caused abortions.

After these failures the author tried to render the corpora lutea of 2 pregnant rabbits functionless by roentgen irradiation of their ovarian areas with superficial doses of from 1 000 to 1 500 roentgens on the tenth eleventh and twelfth days of the gestation. Two similarly irradiated control rabbits carried their fetuses to term. Their ovaries were atrophic at parturition and no corpora lutea were found from twenty to twenty two days after the irradiation. Two other irradiated rabbits received daily doses of 50 units of luteoantigen subcutaneously; parturition did not take place but laparotomies were done from the seventeenth to the twenty fifth day of gestation. The fetuses were normally developed but macerated. The ovaries did not differ from those of the control animals who were irradiated but not otherwise treated.

The author as a result of his experiments claims that the hormonal function of the yellow bodies plays no important part in guaranteeing the maintenance or prolongation of gestation, also that the prolongation of gestation is without doubt due to the gonadotropic factor of the hormone of the anterior lobe of the hypophysis. As a supplement to the above described experiments pregnant rabbits at about the middle of their gestational periods were given follicular hormones 3 times 3 000 2 times 5 000 2 times 10 000 units of glandulin. They aborted at the latest one day following this treatment. Like results were obtained from several injections of 10 cm. of gestation urine heated to 60 C. The author believes that gonadotropic hormone in contrast to the hormone of the posterior lobe of the hypophysis renders the uterus unresponsive to the same degree as it is sensitized by the follicular hormone. To prove this statement the following experiments were made: 8 pregnant animals were injected intravenously with from 0.25 to 1.0 V units glandulin (hormone of the posterior lobe) at the end of gestation. 1 V unit stopped uterine contractions in every animal as shown by exploratory laparotomy. The uterus of 11 pregnant rabbits previously treated with gonadotropic hormone practically did not respond at all to the injection of from 20 to 30 V units given from the fifteenth to the thirty first days of their prolonged gestations. Follicular hormone treatment of pregnant animals with the administration of 1 000 units on both the twentieth and twenty first days increased the uterine contractions in rabbits previously given 0.25 V units of glandulin. Experiments with isolated uterus in Magnus Kelaer preparation yielded the same results. The retained fetuses in these prolonged gestations were fully matured i.e. they did not die prematurely as a consequence of the luteoantigen treatment but because of the prolonged re-

tention. The author hopes to be able to avoid imminent abortions with gonadotropic hormones and to successfully control labor pains with follicular hormone. (BURNETT) MASTERS J SEIFERT M.D.

LABOR AND ITS COMPLICATIONS

Fumarola A. Dystocia Due to the Cervix: A Statistical Contribution (*Le distocie cervicali contributo statistico*) *Atti d. Soc. ital. di ostet. e ginec.* 1938 34 351

In a review of the 27 104 labors occurring at the Obstetrical and Gynecological Clinic of Rome during the past seven years from 1930 to 1936 the author found 95 cases of dystocia due to the cervix. This is a little more than 1 per cent of the total number of labors and 216 of these cases occurred in primiparas. Dystocia due to a congenital anatomical change in the cervix amounted to 2 per cent; those due to a slight previous inflammation of the genital organs to 4 per cent; and those due to a previous gynecological or obstetrical intervention to 6 per cent. The largest group of dystocia was that in which no apparent cause could be discovered and in which the dystocia could be attributed only to a particular neurovegetative constitution of the woman which disturbed the normal function of the uterus. This type occurred in 73 per cent of the primiparas in 33 per cent of the dysmenorrheic patients in 26 per cent of the relatively sterile patients and in all those who represented a defective endocrine type or had a peculiar individual organic constitution.

The prognosis of dystocia in labor is always doubtful on account of the accepted 67 per cent fetal mortality and the 3 per cent maternal mortality. This suggests the necessity of an active treatment to abolish the dystocia by surgical means capable of showing better results vaginal and in many cases abdominal cesarean section should be used more often. The present material demonstrates that these cases are not very numerous when the field is limited to the real anatomical dystocia.

The warning symptoms of dystocia are the appearance of marked lumbar pains preceding labor by several hours or several days; the evident weakness of the uterine contractions which may be a sign of a localized spasmodic condition of the external orifice or of the cervix; the lack of progression of the presenting part at times explainable by the abnormal contraction of the external orifice and the premature rupture of the membranes which is a consequence and not a cause of the dystocia.

In the presence of these signs during the first stage of labor it is very difficult to forecast the future course of the labor but these signs should serve as a warning in order that the course of the labor may be observed carefully and that antispasmodic and analgesic measures may be applied. The latter should recede to second place in all cases in which some organic change in the tissues is associated with the functional incident. In these cases

abstention from vaginal examinations is indicated as much as possible in order that any stimulation which might favor the reappearance of a quiescent dystocia may be avoided. If fever, fetal distress, or putrefaction of the amniotic liquid occurs, recourse should not be taken to metallic dilators but, under spinal or ether anesthesia, to manual dilatation of the cervix and the use of the forceps, preferably that of Tarnier in high presentations. It is always inadvisable to insist on forced dilatation of the cervix in rebellious cases, it is better to rely on simple or multiple incisions of the cervix and, in more difficult cases, on vaginal and even abdominal cesarean section.

RICHARD KEMEL, M D

León, J. Abdominal Cesarean Sections Performed in the Clinic "Eliseo Canton" During the Last Six Years (Cesáreas abdominales efectuadas en la clínica "Eliseo Canton" durante los últimos seis años) *Semana med*, 1938, 45 1033

The author reviews 179 cases of abdominal cesarean sections. The various techniques employed may be broadly divided into three groups: (a) transperitoneal cesarean sections either high, median, or low, (b) extraperitoneal cesarean sections, and (c) cesarean sections followed by hysterectomy.

The various anesthetics were distributed as follows: in 20 cases local anesthesia was used, in 2 cases local anesthesia complemented with general anesthesia (ether) was employed, chloroform was used in 15 cases, ether in 72 cases, chloroform combined with ether in 5 cases, spinal anesthesia in 61 cases, and spinal anesthesia complemented with general anesthesia (ether) in 4 cases.

The various patients were divided into four groups according to the degree of sepsis present. The indications for cesarean section were the following: (1) disproportion between the fetal and maternal parts in 53.9 per cent, (2) placenta previa in 15.6 per cent, (3) rigidity of the cervix in 10.8 per cent (this condition was observed especially in older primiparas), (4) uterine dystocia in 17.8 per cent, (5) premature separation of the placenta in 3.3 per cent, (6) neoplasms, such as myomas or cysts, in 2.2 per cent, (7) pre-eclampsia and eclampsia in 1.7 per cent, (8) heart disease in 1.7 per cent, (9) fetal embarrassment due to non-specific causes in 1.1 per cent, (10) pulmonary tuberculosis in 0.6 per cent, (11) prolapse of the umbilical cord in 0.6 per cent, (12) rotation of the uterus in 0.6 per cent, and (13) dystocia due to a rectal resection for carcinoma in 0.6 per cent.

From this statistical study, León found that the total maternal mortality was 11.6 per cent, whereas the relative maternal mortality was 7.7 per cent. The mortality due to peritonitis was 4.4 per cent and the mortality due to other severe infections was found to be 1.7 per cent. The total maternal mortality of the septic cases was 1.4 per cent and in this series the mortality due to peritonitis was 4.7 per cent. The mortality due to various other septic processes was found to be 2 per cent.

This comparative statistical study shows once more the well known fact that the seriousness of the maternal prognosis grows proportionately with the degree of infection. It shows also that the results obtained with transperitoneal cesarean sections in suspected, potentially, or frankly infected cases are inferior to those obtained with the extraperitoneal surgical approach.

The author believes that arcuate incisions of the lower uterine segment are to be preferred because the number of complications is greatly decreased. He also believes that the therapeutic value of Mikulicz drainage has been exaggerated and that the favorable results obtained are only apparent.

This statistical study also shows unquestionably the superiority of local anesthesia and spinal anesthesia over any form of inhalation anesthesia, especially with reference to the percentage of cases developing peritonitis.

León, however, emphasizes the dangers arising from the use of spinal anesthesia.

In order to reduce the maternal mortality to a minimum León advocates the following procedures: (1) transperitoneal low cesarean section, only in non-infected cases, (2) transperitoneal low cesarean section or preferably extraperitoneal cesarean section in suspected or potentially infected cases (the surgeon should constantly keep in mind the prevention of contamination of the entire peritoneal cavity), (3) extraperitoneal cesarean section in infected cases and ample drainage, and (4) hysterectomy followed by Mikulicz drainage in severely infected cases.

In order to improve the prognosis of infected patients the author recommends the pre-operative use of sulfanilamide.

RICHARD E. SOMMA, M D

PUERPERIUM AND ITS COMPLICATIONS

Trillat, P., and Burthault, R. A Study of 12 Fatal Cases of Pulmonary Abscess Occurring Post Partum and Post Abortion (Considérations à propos de douze cas mortels d'abcès du poumon observés dans le post-partum et le post-abortionum) *Gynec et obst*, 1938, 37 434

The authors report 12 cases of pulmonary abscess occurring post partum and post abortion. These cases were observed in the period from 1930 to 1936, during which time there were 14,000 deliveries and 3,200 cases of abortion in which curettage was done. In this entire series there were 92 deaths from puerperal infection, 26 in the post-partum cases and 66 in the post-abortion. The mortality from infection in the post-partum cases was 1.8 per cent, and 15.4 per cent of these fatal cases showed pulmonary abscess. The mortality from post-abortion infection was 2.06 per cent, with 12.3 per cent of the fatal cases showing pulmonary abscess. Thus, while pulmonary abscess was much more frequent after abortion than after delivery, the percentage of cases of fatal puerperal infection showing pulmonary abscess was much the same.

Among the post partum cases showing pulmonary abscess 2 patients had been delivered spontaneously one of these had had a secondary hemorrhage necessitating curettage the other had had premature rupture of the membranes and transfusion had been done Of the 2 other patients in this group one had been delivered by low cesarean section after a test of labor and the other had been delivered by forceps All these factors predispose to puerperal infection but there was no common causative factor to account for the development of pulmonary abscess

In all the post abortum cases abortion had undoubtedly been induced as infection is rare in spontaneous abortion otherwise there was no common causative factor Four of these patients had been given blood transfusions but there was no apparent relation between the transfusion and the pulmonary lesion in 3 of the 6 cases In 1 the symptoms of pulmonary infarct developed within forty-eight hours after the transfusion

In all these cases the symptoms were those characteristic of pyemia with oscillating temperature and chill a positive blood culture was obtained in only 1 case In two third of the cases the chills were unusually severe and prolonged occurring daily or even twice a day

The pulmonary symptoms were of varying severity In 3 cases there were typical symptoms of pulmonary infarct advancing to suppuration In 1 case pulmonary symptoms occurred early but in the majority of the cases the symptoms and signs were slight A dry cough or light dyspnea was observed in 3 cases In 3 cases signs of pulmonary involvement were found by auscultation In 2 cases the pulmonary abscess was found only at autopsy The physical signs were indefinite or absent in 1 case in which roentgenograms were made a pulmonary lesion was indicated but not its exact nature In 5 or almost half of the cases there was an associated suppurative pleurisy diagnosed clinically and in 1 a slight purulent exudate was found at autopsy Of the 10 cases that came to autopsy 2 showed a single abscess and 8 multiple small abscesses The presence of suppurative pleurisy or of multiple pulmonary abscesses is of more serious prognostic significance than a single abscess Pyemic lesions were frequently found in other organs

ALICE M MEYERS

MISCELLANEOUS

Pouey E. and Domínguez C. M. *The Treatment of Chorio Epithelioma* (Contribución al tratamiento del corioepitelioma) *Bol. Liga contra el cancer gen fem. U. N. G.* 1935 13 3

Pouey and Domínguez report 5 cases of chorio epithelioma which present certain peculiar features worthy of consideration In all 5 cases following treatment a permanent recovery was obtained

In the first case a therapeutic curettage failed to yield any results A hysterectomy was performed

and in the removed uterine specimen a chorio epitheliomatous nucleus in full activity was discovered in the fundus Following the operation the patient made an uneventful and permanent recovery

In the second case following hysterectomy x ray irradiation was instituted upon the lung and the epiphysis Friedman's test which before the operation was positive was found to be negative after the hysterectomy Examination of the specimen removed at operation showed the presence of a submucous chorio epitheliomatous nodule which had not been removed by curettage

The authors were unable to determine the value of x ray irradiation in this particular case inasmuch as they obtained a permanent recovery also in patients who were not irradiated

The third case was that of a woman who following a spontaneous abortion continued to bleed vaginally A curettage was performed and microscopic examinations of the uterine scrapings revealed the presence of a chorio-epithelioma No improvement was obtained from the curettage and four months later the patient returned to the hospital presenting a retrograde vulvovaginal metastasis localized mainly in the right lateral lower third portion of the vaginal wall Two 10 mm tube of radium were introduced into the vagina and the lesion was removed by electrocoagulation The patient made an uneventful recovery

The fourth case was that of a patient presenting a chorio epithelioma who made an uneventful recovery following a simple curettage

The fifth case presented when seen at the clinic a metastatic vaginal lesion A curettage was performed followed immediately by intra uterine radium therapy At the same time 3 radium needles were introduced into the metastatic tumor and were removed after four days Within seventeen days the tumor mass appeared much smaller and the patient made an uneventful and permanent recovery

From a review of the literature and from their own experience the authors distinguish mainly three forms of this lesion (1) typical chorio epithelioma (2) atypical chorio epithelioma and (3) transitional chorio epithelioma In their series of patients the lesion appeared to have originated from retained placental tissue in only 1

From the observations made the authors further more conclude that intramural chorio epitheliomatous lesions are very often missed on biopsy or curettage Because of the deep location of the lesion a uterine curettage is positively of no diagnostic value The authors also advise that whenever a chorio epithelioma is suspected the pathologist should never discard the blood clots of the biopsy material because it is possible they may contain the typical cellular aggregates the presence of which definitely confirms the diagnosis

RICHARD I. SOMMA M.D.

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Priestley, J B • Renal Lipomatosis or Fatty Replacement of Destroyed Renal Cortex *J Urol*, 1938, 40 269

An advanced case of renal lipomatosis is reported. Its clinical and pathological features coincide with the present etiological concept of fatty replacement following inflammatory destruction of the renal parenchyma. From a review of recent literature, several comprehensive contributions having appeared in the last six years, the condition would seem to be most common in advanced calculus pyonephrosis after drainage has been established. Renal lipomatosis is a benign condition and apparently unrelated to renal lipoma, retroperitoneal lipoma, or retroperitoneal sarcoma.

ARTHUR H MILBERT, M D

Higgins, C C • Primary Carcinoma of the Ureter *Ann Surg*, 1938, 108 271

The author gives a review of the literature and reports 5 cases of primary carcinoma of the ureter verified by operation and pathological study. It is concluded from the review that papillary carcinoma is the type of growth most frequently encountered in the ureter and its prognosis is grave. The treatment of choice is nephro-ureterectomy followed by roentgenotherapy.

D E MURRAY, M D

BLADDER, URETHRA, AND PENIS

Sweetser, T H • Cystography, Especially Pneumocystography, as a Guide in the Treatment of Lesions of the Vesical Neck *J Urol*, 1938, 40 285

The pre-operative diagnosis of obstruction of the vesical neck and associated lesions should be made as completely and accurately as possible with the least disturbance to the patient. Cystoscopy should be the last, rather than the first, preliminary examination, and sometimes will not be needed. To this end, the author advocates cystography in association with digital examination, done while an indwelling catheter is in place. Urethrocytography, in proper hands, is a valuable procedure but may at times prove distressing and not entirely free from danger, especially in infected cases.

A series of cystograms, with liquid contrast media and air, are presented, showing common lesions. Pneumocystography with from 30 to 60 c cm of air is a safe procedure. If not diagnostic, it is supplemented by cystography, by means of from 30 to 90 c cm of 1½ per cent sodium-iodide solution. By these methods intravesical projections of the prostate or elevation of the base of the bladder, and the presence of any vesical or prostatic calculi, or tumors or diverticula of the bladder are delineated.



Fig 1 Oblique cystograms (a) with sodium iodide and (b) with air. Patient underwent suprapubic cystotomy and cauterization of bladder carcinoma June 4, 1936, transurethral resection November 6, 1936, because of persistent suprapubic sinus. Cystogram April, 1937, shows no vesical-neck obstruction and no trouble in scar of previous cauterization (to right of catheter tip).

Note large tumor projecting into bladder from its vault (to left of catheter tip on film). In this case air gives much better detail than the sodium iodide.

The oblique view has been found most valuable and often the only one needed (Fig 1a and b).

ARTHUR H MILBERT, M D

GENITAL ORGANS

Smith, J, Jr • Prostatic Obstruction *Australian & New Zealand J Surg*, 1938, 8 19

The author classifies obstructing prostatic conditions into 3 groups: adenomatous hypertrophy, bar formation, and carcinoma. The diagnosis presents little difficulty if cystoscopy is practiced as a routine measure. The proper procedure in any case of prostatic growth with foul-smelling urine is to do a cystotomy, examine the tumors to see if they are operable, and, should an operation for their removal seem feasible, to wait and perform it subsequently.

If carcinoma of the prostate is excluded, there are 3 methods of removing the offending obstruction: perineal prostatectomy, transurethral resection, and suprapubic prostatectomy. The perineal operation of Hugh Young has not found a place in British urology, largely because of the early establishment of the suprapubic operation, and an exaggerated idea of the frequency of postoperative incontinence.

The author states that he has been attempting to perform prostatic resections for the past six years, that he can claim only a few successes, and that he has experienced a number of failures. To become efficient in the use of the resectoscope demands constant application, more than is possible in the work of a general surgeon, and it should not be employed by the occasional endoscopist. The author terminates his remarks on this subject by quoting Cunningham: "Resection is not all that some claim for

it prostatectomy should still be employed trans urethral resection has a place in selected cases the procedure is highly technical complications occur not infrequently the results as regards cure in many instances show failure in some reports the mortality is greater than following prostatectomy the procedure in selected cases is of value if properly carried out and the opinion seems to be that transurethral resection has a place in the treatment of certain types of prostatic obstruction but that its application to all forms is unwarranted

The author discusses hemorrhage following the suprapubic enucleation of the prostate gland and states that if he were restricted to the use of one method of dealing with not only operative bleeding but severe secondary hemorrhage he would unhesitatingly choose the Pilcher bag

Eight hundred and ten patients were treated excluding those suffering from carcinoma It is indeed a dismal fact that only 456 of these patients were in any measure relieved of their incapacity Many of them died shortly after being admitted to the hospital a smaller though equally striking number died following suprapubic cystostomy while many were discharged with tubes in their bladders to mingle with the flotsam and jetsam of the out patient departments Roughly speaking a little more than half of the patients who apply for treatment of their prostatic obstruction are relieved without in any way taking into consideration the temporary and in many cases prolonged morbid ity that follows the removal of the prostate

The figures presented in this paper although they include those of the urologist at the hospital should be taken as representing the experience of the general surgical staff Last year's mortality was 10 per cent

In the author's opinion we may yet witness the treatment of early prostatic enlargement by the physician if he learns to correct glandular imbalance as we grow old Until that time the general surgeon will be continually asked to deal with the problem of prostatic obstruction
ELMER HESS M.D.

Schroeder V. Phimosis (Die Phimose) *Egeben d Chir u Othop* 1937 30 489

Phimosis causes a permanent disproportion between the size of the glans and the circumference width and opening of the prepuce which prevents the retraction of the foreskin Physiological agglutinations pathological cicatrizations and new tissue formations which likewise may prevent retractions but which after their removal do not hinder the retraction of the foreskin are not classified with phimosis

As the size of the glans and of the prepuce may vary because of erections and inflammatory processes and thereby limit the mobility of the foreskin temporarily the author differentiates a condition of relative phimosis which despite the possibility of occasional retraction may lead to a paraphimosis Phimosis is seldom inherited it generally forms on

an inflammatory basis In childhood it occurs as a consequence of uncleanness and inflammatory sclerosis in long neglected agglutinations which choke the youthful prepuce and lead to malformations In adults it forms usually as a sequel of non specific balanoposthitis after specific infections it forms more frequently following *Ulceria molliora* than after gonorrhea further after all kind of dermatoses Senile phimosis occurs as a result of atrophic retrograde processes also frequently after unnecessary or incomplete operative procedures

The numerous sequelae attributed to phimosis always lead to polypragmasy especially because in inherited agglutinations are not always clearly defined nor definitely severed The author endeavors to evaluate the numerous injuries and sequelae charged to phimosis in the literature However there are so many important contradictions in the statistics that definite operative indications and basic principles cannot be established This is especially marked upon consideration of the connection between phimosis and carcinoma of the penis and also of genital infection and carcinoma of the penis Regarding the former it should be understood that every pathological condition of the prepuce favors this eventual ity hence must be eradicated but the obligatory (ritualistic) circumcision should be discouraged A carcinomatous probability exists neither in the prepuce in the physiological agglutinations nor in phimosis *per se* but must be reckoned with in phimosis associated with inflammatory complications balanitis chronic edemas sclerosis and scar formations especially in diabetic balanitis and syphilitic sclerosis in these there is also probably a racial factor to be considered

Statistics waver between 15 and 100 per cent with regard to the relationship of carcinoma and phimosis Carcinoma of the penis is seldom found in the prepuce it never was found in Jews who were circumcised before they were eight days old The author stresses the possibility of racial influences while the morbidity from carcinoma of the penis varies between 0.6 per cent and 4 per cent in Europe Indo China records that 17.5 per cent of all carcinomas are carcinomas of the penis While phimosis often removes the site of carcinoma (the prepuce) circumcision undertaken for this purpose would be equivalent to a prophylactic tooth extraction or a prophylactic appendectomy To excise a healthy prepuce for fear of carcinoma is far fetched However its removal or treatment is indicated if inflammatory conditions exist that could possibly lead to carcinoma Since a number of histological examinations established the fact that carcinoma has followed leucoplakia and precancerous conditions resulting from inflammations phimosis therapy must be instituted after chronic inflammations when cancer threatens and include the excision of all possible pathological tissue of the prepuce

The bloodless treatment of phimosis by manual or instrumental stretching is limited by the primary distensibility of the prepuce and by the possible scar

formations that would be more or less ominous. Only in mild cases of phimosis, in boys under two years, will the systematic bloodless treatment bring about a normal prepuce, but, occasionally scar formation and stenosis may result. Preventive treatment in inflammatory agglutinations consists of separation with a sound under strict asepsis.

Indications for operation are pathological tissue changes of the preputium, non-healing after liberation of the agglutinations and other conservative methods during childhood, such as stretching of the prepuce after two years of age, which is progressively less successful, inflammations not responding to antiphlogistic therapy, anuria and other complications, and the definite phimosis of adults. Conditional indications are instances in which the child is psychically or sexually influenced by conservative treatment.

After discussing the technical details of operations and the various methods of anesthesia, the author tries to bring order out of chaos, to evaluate the operative procedures and the many methods recommended, and to give the acknowledged indications for surgery, all of which are based on the technique of circumcision, resection, and dorsal incision. As a preliminary measure, the frenulum plastic procedure of Thiersch is advisable. The old dorsal incision causes ugly disfigurements with apron-like flaps and frequently a disturbance in the lymphatic circulation which leads to chronic edema of elephantiasis proportions. Various modifications of this incision are utilized to prevent the conditions mentioned, viz., short incision, multiple incisions, lateral or ventral incision, oblique incisions, separate division of the skin and mucous layers, which will enable one layer to replace the other, and still other modifications. A practical method for easy cases, according to the author, is the operation of Schloffer (modified by Schoening and Kazda). For hyperatrophic cases, a recent procedure following the old Roser method should be used, the Druener modification of the somewhat complicated Tobiazek operation. Single or multiple incisions are advised in cases with inflam-

matory processes and with paucity of tissue, in which the more complicated procedures are contraindicated. Circumcision and resection cause defects, and, therefore, are justifiable only in cases with a hyperabundance of prepuce, and with pathological tissue that absolutely requires and justifies such excisions without consideration of the protective cover for the glans. However, the surgical circumcision, in contrast to the ritualistic, should provide for a protective cover of the glans and remove only abnormal and superfluous tissue, but the removal should be extensive enough to reach the sulcus in order to prevent scars. For phimosis in children circumcision is the operation of election for the attack of the narrow preputial ring, extensive narrowing of the entire foreskin demands resection or plastic surgery. In resection, the author advises removal of the mucous membrane and retention of the outer skin as the latter is more resistant to venereal and other kinds of infections, and is a better protective cover for the glans. Since expanding the prepuce is done at the expense of its length, all circumcisions and resections leave a paucity of tissue with a consequent bareness of the glans. All phimosisectomy methods bring up the consideration of plastic procedures, the author advises the surgeon to limit his procedures to a few methods and then to individualize them. The author refers to the Sievers operation with the "preputial flap" merely as another operative procedure for phimosis and does not credit the real purpose of this method, i.e., the maintenance of normal relationships and avoidance of unnecessary and disfiguring operations for phimosis by removal of merely the superfluous tissue. The author reviews the most important operative methods described in the literature and includes clear, elucidating red and black drawings. He describes and gives explanatory notes concerning all the newer procedures as scattered promiscuously in the literature of surgery, urology, pediatrics, dermatology, and also gynecology, a comprehensive bibliography is added. A short chapter devoted to paraphimosis is appended. (SIEVERS) MATHIAS J SEIFERT, M D

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Berger W. Arthritis and Tuberculosis (Arthritis und Tuberkulose) *Ergbn d inn Med u Ki*
berl 1937 53 233

Berger discusses the question of arthritis and tuberculosis and comes to the conclusion that the existence of tuberculous arthritis can be proved.

He summarizes the theory of tuberculous arthritis. The Koch bacillus as a local infecting agent can cause arthritis just as any other agent in man and probably in animals. It produces (a) cases of positive tuberculosis in which a slight or severe arthritic reaction appears some time during the course of the disease and (b) cases apparently non tuberculous which on careful study can be proved to be of tuberculous origin. Unknown causes of arthritis and rheumatism are not to be excluded but the tuberculous theory takes care of them in a considerable number of cases.

The pathogenesis in a large number of cases is a hematogenous distribution of bacilli in which the bacilli in the joint have a disposition to adhere and produce inflammation of various types depending on the state of reaction and on the bacilli themselves.

The possibility of tuberculosis being a partial cause of the arthritis with the assistance of other exciters as well as the rôle of numerous non infectious accessory factors must likewise be considered.

The tissue picture of joint damage from tuberculosis is not uniform and may be diagnosed as joint tuberculosis fungus carrier fistula formation or tuberculous arthritis. Tuberculous arthritis has been described differently by the pathologist and the clinician. The clinical definition must absorb the anatomical features but without post mortem examination this condition is sometimes believed to be simple non suppurative and often rheumatic inflammation not only upon diagnosis but also on the basis of the similarity in the course prognosis and therapy.

The anatomical picture of tuberculous arthritis may be (a) a tubercle forming type of tuberculous inflammation, milky tuberculous and more diffuse tuberculous granulation tissue (b) tubercle free or granular free morphologically uncharacteristic simple tuberculous inflammation (c) according to the work of Coronini and his coworkers probably also a picture of the so called rheumatic granulomatosis or one scarcely to be differentiated from it (d) fibrotic ankylosing scoliotic and destructive type of inflammation and (e) a mixed type of inflammation. A vital point in the theory is that the formation of tubercles may be lacking or present at different times and places so that even a negative tuberculin test does not exclude tuberculous pathology.

The clinical picture of tuberculous arthritis (with the exception of the true tuberculous joint) with

regard to its course severity joint symptoms and the general condition is known to imitate many other conditions such as focal infarct arthritis and the so called true joint rheumatism so that the diagnosis for the present can be only etiological and not symptomatic. It is a great advancement that at present the bacteriological cause of certain diseases can be determined.

As to the frequency of primary tuberculous arthritis reliable statistical information is not yet established however it is a false opinion that this condition occurs only exceptionally. The majority of cases of primary tuberculous arthritis are misdiagnosed. They occur with considerable frequency among the cases of arthritis observed daily. The worker who attempts to establish an etiological agent in every case will be surprised how often tuberculosis alone or in association with other infections is responsible. It is the duty of every clinician to prove that tuberculosis is not the cause of an infectious arthritis in which another etiological agent cannot be established.

It is being recognized more and more that an inflammation without tubercle formation may be tuberculous and that mild evanescent tuberculous inflammation can produce lymphadenopathy tenosynovitis dry pleurisy and simple articular pains. It is recognized further that the clinical picture of rheumatism may be produced not by one specific organism but by various bacteria also that the typical rheumatic granulomatosis should be considered not only from the standpoint of a specific etiological factor but also as an allergic tissue reaction similar to that caused by various antigenic agents among which tuberculosis may be considered.

Berger emphasizes that the clinician must work together with the bacteriologist and pathologist in determining the etiological agent. He considers the clinician's discernment and treatment of primary importance. Though science may still argue whether sufficient proof of the presence of tuberculous bacilli in the focus of the disease has been given and what the highest percentage of bacilli may be at least experimentally anti tuberculous treatment should be initiated in the many cases of possible suspected tuberculous arthritis.

The article contains 13 illustrations and a bibliography (Di Monte) Richard J Bennett Jr MD

Sandström C. Peritendinitis Calcarea a Common Disease of Middle Life Its Diagnosis Pathology and Treatment *A J Roentgenol* 1938 40

Peritendinitis calcarea is a proposed name for a rather disabling generalized disease entity of middle life with rheumatic symptoms and calcific deposits in tendons and peritendinous capsular and ligamentous tissues.



Fig 1

Fig 1 Female, aged forty-six Roentgenogram shows calcification near the greater tubercle. Macroscopic localization of the calcifications: the supraspinatus tendon and the peritendinous connective tissue between the tendon and joint capsule. Microscopic localization: supraspinatus tendon, peritendinous connective tissue, and joint capsule.



Fig 2

Fig 2 Female, aged sixty-nine Roentgenogram shows extensive calcifications near the external femoral condyle.

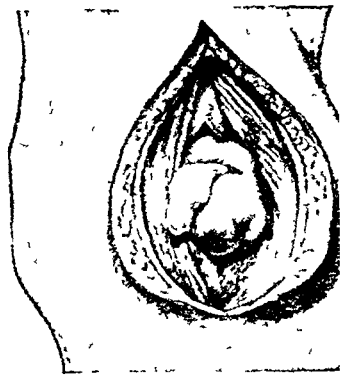


Fig 3

Fig 3 The same case as in Figure 2. At operation the calcifications were lying in a sac fixed at the tendon of the gastrocnemius muscle. The calcifications were exposed when the thin sac was opened.

The calcific deposits in the 329 cases observed were nearly all in the vicinity of joints, especially at the shoulder and hip.

The clinical course of peritendinitis calcarea may be divided into the acute, chronic, and latent forms.

In the acute stage the pain and tenderness is frequently intense and all active and passive movements are often completely inhibited. Local edematous swelling may be present. Increased sedimentation velocity and fever seldom occur. In the chronic form the above symptoms and disabilities are very much milder. Exacerbations occur not infrequently. In the latent form the lime deposits can be demonstrated by roentgenograms but they produce no symptoms. In 12 of 20 latent cases symptoms appeared during a five-year period.

It is often necessary to take tangential roentgenograms in various planes as if "shooting around" a bone to demonstrate the lime deposit. Stereoscopic roentgenograms offer no advantage because the object is to obtain a view of the lime salts free from the bone.

The shadows seen in acute cases are often thin and of cloudy character and ill-defined from the surroundings. In cases of longer standing the shadows are often dense, well set off from the surroundings, and homogeneous. In other cases, they appear as small granules or drops, partly confluent with large irregular shadows. The shadows show no structure, sometimes they reveal a stratified arrangement, the calcifications obviously are then localized in certain preformed spaces of the soft tissue. Often the shadows are exceedingly small, appearing as conglomerations of tiny points, in such cases it may be impossible to make a diagnosis from the roentgenogram alone.

In long-standing cases of peritendinitis it exceptionally happens that one finds an indication of

bony structure, but the general rule is that shadows with bony structure do not represent the calcifications of peritendinitis.

The most important differential roentgen diagnosis lies between post-traumatic myositis, tendinitis ossificans, and various forms of senile proliferative processes from periosteal joint capsules, tendon, and facial structures. In the post-traumatic conditions early structureless lime deposits are soon absorbed or replaced by shadows with bone structure. The senile alterations of the tissues in question often represent formation of bone, and scrutiny of the film does not fail to reveal the bone structure.

A pathologico-anatomical examination was made in 13 cases. Calcifications were never found with bursa. One specimen showed lime deposits in the wall of a bursa, others showed calcifications inside small cavities lined with endothelium and located within or adjacent to a tendon. Six specimens had calcifications within and close to the tendon of the supraspinatus muscle. The histological characteristics were inflammatory and were made up of alternative, proliferative, and exudative changes.

The etiological factor is unknown. An allergic phenomenon similar to that thought by some to be associated with the acute attack of uric-acid gout is mentioned as a possible cause.

The chief treatment is roentgen irradiation. The detail of the technique is described. Massage is contraindicated because it increases the symptoms. Analgesics are given for the temporary relief of pain when needed. In chronic cases lasting fixation of joints may occur and carefully graded active and passive exercises are indicated.

The relief of symptoms is not necessarily coincident with the disappearance of the lime deposit. A patient may become free from pain and discomfort while the calcium deposit remains, but usually the

deposit is diminished in size and density. In such cases the treatment is continued until the deposits have completely or almost completely disappeared. In some cases this does not occur but deposits persist sometimes with a faint bone structure due to secondary osteoblastic bone formation.

In more than half of the acute cases the treatment takes from two to five weeks. In a quarter of the cases the treatment has continued from two to four months. Few cases have been treated for a year. The chronic cases have been treated from two to eight months in some cases up to a year and a half.

Six patients only have obtained neither subjective nor objective benefit from the treatment. Four have been operated upon later and the deposits removed. Immediate satisfactory results followed 2 operations in the other 2 cases slight improvement only was obtained. In these refractory cases renewed roentgen treatment was followed by complete recovery. At operation the calcium deposits were found within sacs lined with endothelium in the tendinous or connective tissue. The conditions of resorption thus no doubt were less favorable than when the deposits are located directly between the fibers of the connective tissue.

Time deposits may disappear spontaneously just as pain may cease while the deposits remain and lime deposits may be found without pain past or present.

ROBERT P. MONTGOMERY, M.D.

Turner P. Acute Infective Osteomyelitis of the Spine. *Brit J Surg* 1938 26 71.

Until recently acute osteomyelitis of the spine was considered not only rare but a fatal disease. This was true because only the very severe cases were recognized and even many of these were undiagnosed until necropsy. Of late many more cases are being reported because of a better understanding of the importance of this condition as a cause of obscure suppuration.

The author reports 12 cases of his own and reviews 71 cases reported by other men. The lumbar spine is most commonly involved. A history of skin lesions was frequently noted although trauma was unusual.

The focus is small when the laminae and processes are involved although the infection may be diffuse when the body is involved. Roentgen ray evidence is usually absent until late and even then points to a small focus. The infecting organism was found to be the staphylococcus aureus in the majority of the cases. It was difficult to differentiate the more chronic cases clinically from secondarily infected tuberculous abscesses.

Suppuration and abscess formation were frequent. Infections of the cervical vertebra produced retropharyngeal abscesses or abscesses which presented in the posterior triangle of the neck.

Infection of the thoracic vertebra sometimes invaded the mediastinum, pleura or lungs. In the lumbar region the abscesses produced perinephritic and psoas abscesses. Involvement of the anterior part of the sacrum presented a diagnostic problem

because in some cases it produced abscesses which presented at the perineum resembling an ischio-rectal abscess.

Extension of the infection to the spinal canal was an infrequent but fatal complication.

The mortality in this series ranged from 50 to 70 per cent.

Treatment consisted of (1) drainage of the abscesses (2) removal of accessible involved bone and (3) prevention of deformity.

DANIEL H. LEVINTHAL, M.D.

Krook S. S. Septic Osteomyelitis of the Os Pubis (Septische Osteomyelitis im Os Pubis). *Acta ch Scand* 1938 81 221.

Three cases of acute septic osteomyelitis of the os pubis which were recently received in the hospital at Visby (Island of Gotland) are reported in the hope that they may be of value in the determination of whether operation will be necessary in all cases particularly the radical opening and curetting of the marrow cavity as recommended in 1930 by Goederlund.

The first case reported was a severe case in a pregnant woman twenty-seven years of age who suddenly developed painful weakness and extensive sensory disturbances of the lower extremities and the pelvic and lower abdominal regions following a mild febrile attack with pain in the left ear. After several weeks of improvement and regression of the condition the patient aborted and a few days thereafter an abscess developed in the pubic region. When the abscess was opened extensive purulent infiltration of the adjacent soft tissues was found; the upper border of the pubic bone was felt to be roughened and the streptococcus was cultivated from the pus. The other 2 cases, those of a sixty-seven year-old and a thirty-seven year-old woman respectively, were of much the same character but milder. Both patients recovering in a few weeks time without operation.

The roentgenograms revealed very little change and in no case was there evidence at any time of sequestrum formation. The intercurrent attacks of fever and the bacteriological findings in the first case, the presence of a complicating rheumatic endocarditis and arthritis in the thirty-seven year-old woman and the rather typically septic course with sudden onset and remarkable recovery in all 3 cases pointed to the presence of a septic not a tuberculous process.

JOHN W. BRENNAN, M.D.

Martí J. Ischionitis Acrostealgia Homologous with Coracodolitis (I ischionite acrostal e homologue de la coracoite). *Rev d'orth* 1938 25 283.

Four cases of ischionitis are reported in which the lesion involved the tuberosity or apophysis of the ischium. Acrostealgia is the term employed by Bonneau to an apophysitis no matter where the origin.

The muscles attached to the tuberosity of the ischium are the femoral biceps, the semitendosus and

the semimembranosus. Histological studies of tendinous insertions show them to be excessively rich in sensory elements. The sympathetic nervous system is thought to be responsible for muscular tonus and likewise transmits the pain sensations of the muscle and more especially of the tendinous insertion.

Four patients are presented complaining of pain following a fall on the buttock or on the side, in which a quick act and forced straightening movement was carried out in order to avoid a fall. The pains immediately after the trauma were rather diffuse but they localized slowly in the region of the ischium and lasted for weeks or months.

Objective examination showed that flexion of the trunk was very painful and likewise limited because of elongation of the muscular group inserted on the tuberosity of the ischium. The same pain was observed in lateral flexion of the trunk to the healthy side. Lateral flexion of the trunk to the injured side was painless because of the fact that the ischiatic muscle group was not elongated.

Lasèque's sign was positive, that is, pain was experienced in the attempt to flex the well extended leg on the pelvis, otherwise there was practically no pain with the leg flexed on the thigh and the thigh flexed on the pelvis.

There were no visible pathological changes except in 1 case in which there was widespread ecchymosis of all of the thigh.

Palpation of the ischium and adjacent regions produced very severe pain, the course of the sciatic nerve being painless except for the sacro-iliac point situated behind the great trochanter.

The cutaneous sensibility was intact. Reflexes of the injured member presented nothing abnormal. Muscular atrophy was not observed. The roentgenograms were negative for bone pathology. A long course of treatment was carried out when the pain was refractory to all usual treatment. Frequent relapses were observed upon the slightest effort.

In 1 case the ischionitis was due to direct traumatism, in the other 3 to indirect trauma. In order to avoid a fall, the patient contracted his femoral quadriceps muscle in an attempt to make a quick straightening and the proximal part of the ischiatic muscle group was pulled abnormally, which in turn produced lesions of tearing at that level from which the symptoms developed. A pulling-up of the bony fragments produces an irritation and provokes ossification which resembles the Pellegrini-Stieda type at the point of insertion of the elongated muscle. A histological examination was not made in these 4 cases.

Ischionitis must be differentiated from sciatica, muscular and articular rheumatisms of the hip, and osteomyelitis.

The prognosis is good in apophysitis but the treatment is of long duration. The question of cure has not been solved. The most important factor is absolute rest in bed temporarily. Heat should be tried in all its forms: the application of poultices, the electric

heating pad, diathermy and points of fire. Auto-hemotherapy should also be given a trial. The injection of acetylcholine, shock therapy, local infiltration of the painful region, or lumbar epidural injection of 1 per cent novocaine, have given fine results in 2 cases.

RICHARD J. BENNETT, JR., M.D.

Del Torto, P. Congenital Pseudarthroses of the Tibia (Pseudoartrosi congenite della tibia). *Riv di chir.*, 1938, 4, 265.

The author records the study of 5 patients with pseudarthrosis of the tibia in detail. The pathogenesis of this condition remains obscure. Among the causes which the author suggests are intra-uterine compression or fracture of the tibia with subsequent non-union, the presence of a fetal skeletal disease, and amniotic disturbances with adhesions about the leg and local arrested development. As regards the last, it is suggested that pseudarthrosis always occurs in the same region at the junction of the lower and middle thirds of the tibia possibly because of alteration, obliteration, or absence of the nutrient artery. Other parts of the tibia develop well because of the blood supply from the attached muscles.

Histological examination of the specimens reveals certain characteristic changes among which are signs of local irritation, osteitis, periostitis, and perivascular infiltration. Others have described the picture of osteitis fibrosa in connection with pseudarthrosis.

The prognosis in pseudarthrosis should always be guarded because of the relatively few good results reported.

The treatment suggested by the author includes complete excision of the region of the pseudarthrosis up to a region of macroscopically normal bone. The fragments are then immobilized absolutely with a massive bone transplant covered with periosteum.

A. LOUIS ROSI, M.D.

Bruce, J., and Walmsley, R. The Arches of the Foot and Flat-Foot. *Lancet*, 1938, 235, 656.

Conventional clinical teaching recognizes three distinct arches in the foot, the longitudinal arch, the tarsal arch, and the anterior metatarsal arch.

The author states that there is no acceptable evidence for the existence of an anterior metatarsal arch. The longitudinal arch has a more definite structural entity.

A series of sections and dissections of fetal feet of different ages were made and examined. These all demonstrated that the longitudinal arch is present from the time that the cartilaginous precursors of the foot bones are formed. A transverse arch is also invariably present in the region of the bases of the metatarsals. No evidence was obtained, however, to suggest the presence of a transverse arch in the region of the heads of the metatarsals in either fetal or adult feet. It was therefore suggested that the diagnosis of "anterior flat-foot" should be dispensed with.

The author contends that metatarsalgia is due to a separation of the metatarsal heads which in time leads to stretching of the transverse ligaments of the metatarsal heads. This type of metatarsalgia should be distinguished from Morton's which is a neuritis of the digital nerves caused by their compression between too closely approximated metatarsal heads.

Additional evidence of overstrain as a factor in the production of metatarsal pain is to be found in the frequently dorsiflexed position of the toes. This is due largely to the unopposed contraction of the long and short extensor and flexor tendons in consequence of the insufficiency through atrophy of the lumbrical interosseous mechanism.

So far as treatment is concerned there are three points of practical importance. Appliances or pads which are intended to be under the intermediate metatarsal head and restore an imaginary arch are wholly irrational. A metatarsal bar is useful in so far as it increases the effective weight bearing surface of the metatarsal region but ultimate success depends on restoring the balance between the metatarsus and its load. This last end may be served in several ways. Regulation of the body weight is always an important consideration and circular strapping of the forefoot may relax the overstretched transverse ligaments. The most important single step however is the restoration of functional activity to the lumbrical interosseous system and in this connection the preliminary correction of a fixed toe deformity is essential. Tenotomy of the extensor tendons on the dorsum of the foot and of the contracted flexors opposite the interphalangeal joints will permit the toes to be straightened easily if thereafter they are kept in the corrected position by means of a plaster of Paris cast for some weeks and if a metatarsal bar is worn on the shoe after the removal of the plaster recurrence of the metatarsalgia will usually be avoided.

Flat foot in its longitudinal axis is often quite painless until in late adult life osteoarthritic changes appear in the tarsal joints. The indiscriminate belief that flat foot accounts for pain in the region of the head of the talus is therefore to be condemned. Pain is more commonly felt while the ligaments supporting the arch are being strained; it is therefore due to the flattening rather than the flattened foot and occurs in circumstances as occasioned either with overloading of the arch e.g. occupational strain or increase in the body weight or with factors undermining the health of the structures supporting the arch such as loss of tone in the muscles from disuse through illness or long recumbency. A better description of the resulting clinical syndrome would be longitudinal foot strain.

It is thus clear that attempts to straighten the foot and to obliterate the arch completely by manipulation are contraindicated in cases of longitudinal foot strain. In these cases the proper measures appear to be an improvement in the muscle tone of the foot by an appropriate combination of rest and exercise together with some adjustment of the load

by regulation of the body weight and its partial deflection to the outer side of the foot by elevation of the inner part of the sole. In chronic tarsal arthritis however just as in chronic arthritis at other joints considerable improvement may result from a correctly applied and well executed manipulation. Experience of such improvement does not justify the manipulative obliteration of the arch in the adolescent or young adult nor does it prove that the longitudinal arch of the foot is nothing more than a structural deformity of the civilized races.

NORMAN C. B. LOCK, M.D.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

Speed, A. Spondylolisthesis. Treatment by Anterior Bone Graft. *Arch. Surg.* 1918, 37, 173.

Spondylolisthesis has been defined as a deformity in which the body of the fifth lumbar vertebra and the portion of the spinal column above it slip forward over the base of the sacrum. The term means slipping vertebra.

The literature on spondylolisthesis is thoroughly reviewed. Anterior fusion of the lumbosacral area was done five times before the case reported by the author. One case was performed by Jenkins, 1 by Burns and 3 by Mercer.

The author's patient was a man aged forty-eight years who had been injured fifteen years previously. There had been pain in the lumbosacral region followed shortly by progressive lameness in the left leg. Claudication in the left leg persisted and backache continued up until eighteen months before admission to the hospital when it was necessary for

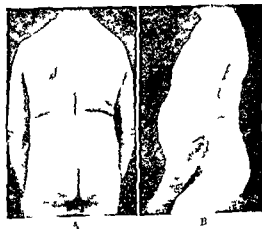


FIG. 1—A, a man with spondylolisthesis viewed from behind. The depression at the lumbosacral level and the hypertrophy of the spinal muscles can be seen. The deep crease around and above the iliac crests is characteristic. B, lateral view of the same patient. The thoracolumbar lordosis and the protuberant abdomen are apparent.



Fig 2 —Section through a human (normal) pelvis after the insertion of a bony transplant for illustration. When spondylolisthesis is present it is not so difficult to insert the transplant or a Smith-Petersen nail as it is in the normal bone. The overhang of the body of the fifth lumbar vertebra permits a more direct and less oblique angle of insertion and a deeper penetration into the first sacral body.

the patient to cease work. Following another injury after which the symptoms of the back and legs had increased in severity, roentgenological examination demonstrated a slipping forward of the body of the fifth lumbar vertebra.

On admission to the hospital the patient complained of backache and claudication of the left leg. The general physical examination and laboratory data showed little abnormality (Fig 1). The patient's back was definitely lordotic, most marked at the lumbosacral junction, bounded on each side by prominent spinal muscles. Extending from this depression was a bilateral transverse crease in the skin. The abdomen was protuberant. The patellar tendon reflexes were slightly exaggerated.

Extension of the spine by traction on the head and legs failed to produce a satisfactory improvement in the lumbosacral deformity.

Under general anesthesia, a bone transplant 1 cm. wide was removed from the anterolateral surface of

the right tibia. The abdomen was opened through a right paramedian incision, the abdominal viscera were packed away from the sacral promontory, and the projecting body of the fifth lumbar vertebra was exposed. A vertical incision was made through the peritoneum over the body of the fifth lumbar vertebra and the fourth intervertebral space, slightly to the right of the middle sacral artery. The aortic arch, the left common iliac vein, and the inferior vena cava did not interfere with the procedure. The sympathetic nerve plexuses were reflected. A drill 1 cm. in diameter was then inserted at the upper border of the fifth lumbar body and directed downward into the first sacral segment (Fig 2). When the drill had entered the required predetermined distance, it was withdrawn and the tibial transplant fitted snugly into the drill hole. The peritoneum was closed with a running catgut stitch. The abdomen was closed in layers.

The patient's recovery was almost uneventful. The patient had been admitted to the hospital April 26 and operation was performed on May 10. On August 17 the plaster corset was removed and roentgenographic findings showed the bone transplant to be in the same position. On September 6 the patient was able to walk without support and was free from pain in the back, but there still was a little dragging in the leg and some fatigue in the upper part of the thighs after he had walked two blocks.

RICHARD J. BENNETT, JR., M.D.

Steel, W. A. The Relief of Chronic Backache and Sciatica by Minor Surgical Measures. *New England J. Med.*, 1938, 219, 874.

Long-continued faulty posture is the usual predisposing cause of chronic backache and sciatica. Faulty posture is most frequently the result of flat foot and functional muscular insufficiencies. Occasionally it is due to a permanent body list from organic muscle lesions or paralyses, or to bone shortening from old fractures or joint disease.

The immediate exciting cause of backache and sciatica is trauma of some form. Contributory exciting causes are many and the pain produced may be referred or direct. Referred pain arises from disease in other parts of the body and its sources include foci of infection, chemical or metabolic toxins, tuberculosis and metastatic cancer of the spine, tabes dorsalis and other cord diseases, and pelvic abnormalities of the rectum or genitalia.

Direct pain usually arises from lesions in or about the fifth lumbar vertebra. Such lesions may be anatomical variations or local degenerative changes. The latter include narrowing of the disc, hernia of the nucleus pulposus, sacro-iliac strain, osteoarthritis, fibrosis of the fascia, muscles, and nerves, and spondylitis.

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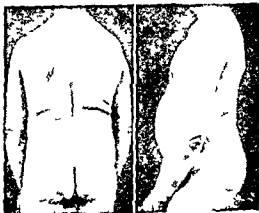


Fig. — (A) a man with spondylolisthesis viewed from behind. The depression at the lumbosacral angle and the hypertrophy of the spinal muscles can be seen. The lip crease around and above the iliac crest characteristic of lateral view of the same patient. The thoracolumbar lordosis and the protuberant abdomen are apparent.



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RICHARD J. BENNETT, JR., M.D.

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The immediate exciting cause of backache and sciatica is trauma of some form. Contributory exciting causes are many and the pain produced may be referred or direct. Referred pain arises from disease in other parts of the body and its sources include foci of infection, chemical or metabolic toxins, tuberculosis and metastatic cancer of the spine, tabes dorsalis and other cord diseases, and pelvic abnormalities of the rectum or genitalia.

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Any contributory cause of chronic backache and sciatica may be important but few causes give symptoms without the factor of trauma, either acute or chronic, from long-standing poor posture. The symptoms of mild cases are muscle fatigue and

stiffness of the back in the morning followed by pain over the sacro iliac joints and buttocks. Sciatica usually follows the backache which is intermittent and aggravated by movement raising of the straight leg and exposure to cold or wet.

The majority of cases are mild and yield to palliative or minor surgical procedures. Thorough historical physical laboratory and roentgen ray studies should first be made. Toxic foci must be eliminated and faulty posture corrected. The latter is best done by active or setting up exercises and the e should be insisted upon even if they are painful and the patient is elderly. Golf is recommended for middle aged men. Flat feet are corrected by proper shoes and middle aged women are urged to wear moderately high heeled shoes to stimulate an erect posture. Local heat and massage to the back is helpful for its effect on the circulation the pathological changes apparently being a form of ischemic neuritis. Passive motions of the hip and pelvic and spinal joints are less effective than active motion and are contraindicated in cases of advanced bone disease.

Nerve stretching is done in one of three ways manipulation by passive motion the intraneural injection of novocaine followed by manipulation and the epidural sacral injection of novocaine. The epidural injection offers the most hope for the cases of sciatica coccydynia or sacro iliac pain of long duration. The technique of each procedure is given in considerable detail. Paravertebral injections of alcohol are used only in cases of intercostal cervical or purely sensory nerve disturbances or when the motor function is unimportant.

In severe cases with constant pain sensory and motor reflex changes muscular twitching or atrophy and rigidity of the lumbar spine these palliative and minor surgical measures are insufficient. Such advanced cases are in the minority but for them major procedures such as fasciotomy spinal fusion and laminectomy are indicated.

CHESFR C GUY M D

FRACTURES AND DISLOCATIONS

Bosworth D M. Gas Bacillus Infection as a Complication of Fractures. *J Bone & Joint Surg* 1938 20 985

Two per cent of all the wounded in the American Expeditionary Force were infected with gas bacilli and 48.52 per cent of these died. In 1930 Larson and Pulford reported 7 cases in all of which the gas infection was controlled with serum which they used unrefined and in amounts up to 1000 c cm. The author points out that the most noteworthy fact was that amputations were not done. In 1936 Kelly and Dowell reported a series of cases, all of which except 7 were treated by roentgen therapy and with serum the 7 being treated by roentgen therapy alone. In this series 45 per cent of the patients who had amputations died while none of the patients who had no amputation died. The

author believes that one of the most rational reports on the bacteriology of these infections and the establishment of diagnosis was made by Reeves who also holds that capsule stain tests for bacillus welchii or cultural methods for the other organisms must be done to establish their presence definitely. The differentiation between true gas bacillus infection and the gas infections in old or diabetic patients further confirms the pathological changes which are found. Liver change is a common finding in late cases associated with jaundice. Discolored dark distended or even partially liquefied muscles are not always dead.

Relative to the diagnosis the most outstanding impression the author has received has been of a very sick patient slightly disoriented complaining of great pain if asked but otherwise lying quietly with a flushed face very rapid pulse and no high temperature. Percussion of the skin anywhere near the wound area will give a tympanitis and palpation crepitus. The wound is drier than usual and the underlying tissues will have a doughy consistency tending to bulge through the skin opening. Roentgenographic examination will show gas in the soft tissues but for a positive diagnosis it must show an increase in the amount of gas over an interval of time. A smear from the wound anaerobic inoculation animal liver injection and incubation capsule stain and the beginning of cultural identification should be immediately undertaken.

Bosworth believes the prophylaxis with both gas and tetanus antisera should be the rule in all cases of compound fractures. Amputation should never be done for acute gas bacillus infection although it may later be necessary because of deformity repeated massive doses of intravenous polyvalent serum should be continued until the gas bacillus infection is controlled draining but not débridement should be instituted (many tissues first thought to be dead may later be found viable). Roentgen therapy may yet prove to be of the greatest help and Orr dressings and treatment may be safely carried out as in any other infection of bone once the acute gas infection has been brought under control without regard to the presence of bacillus welchii and its associates which remain lying apparently inert in the wound.

Three case reports are included in this article.

FERN C BOSWORTH M D

Fèvre and Mialaret J. Indications and Technique for the Retroglenoid Buttreys Graft in Posterior Dislocation of the Shoulder (Indications et technique des buttes rétro-glénoidiennes dans les luxations postérieures de l'épaule). *J de Ch* 1935 52 156

Fèvre and Mialaret note that posterior dislocations of the shoulder for which the retroglenoid buttress can be employed to advantage are rare in adults but occur more frequently in children.

They report the case of a girl eleven years of age in whom a posterior dislocation of the shoulder re-



Fig 1 Roentgenogram before operation



Fig 2 Roentgenogram a year and eight months after operation, showing the normal position of the humerus in spite of partial atrophy of the grafts

sulted from a fall. The dislocation was repeatedly reduced but always recurred. The roentgenogram showed the humerus to be well formed but the glenoid cavity was definitely reduced in size. The child showed no other deformity. At operation the dislocation was reduced, and two bone grafts were placed at the base of the neck of the scapula, one crossing the supraspinous fossa, the other the infraspinous fossa. The arm and shoulder were kept in a plaster cast for a month. Eight months after operation, the results were excellent with normal anatomical position and function of the shoulder joint.

The authors consider the use of retroglenoid buttress grafts to be the operation of choice in recurrent or permanent posterior dislocation of the shoulder, whether due to trauma, or to a congenital deformity.

With the authors' technique, a subdeltoid approach is often sufficient for reduction of the dislocation and placing of the grafts. In other cases, in which reduction is difficult, the Duplay-Kocher method is employed. In children the resection of the acromion can be avoided by dividing the acromion from the spine through tissue that is still cartilaginous. This was the technique used in the case reported. The bone grafts are taken from the internal surface of the tibia; they are made up of periosteum

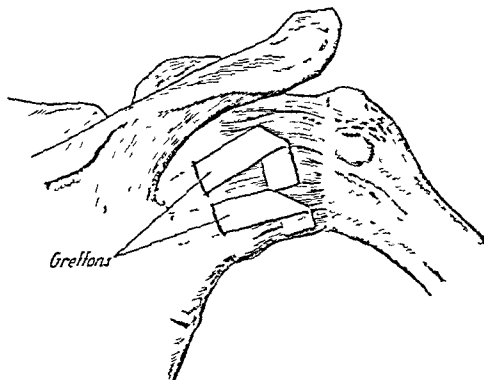


Fig 3 The grafts in place

and a thin layer of bone. The grafts are placed in tunnels prepared for them. The upper graft is slanted upward and outward, the lower graft slightly downward. The upper graft is bent at a right angle to itself at the upper end and the end brought down to contact the lower graft, the continuity of the periosteum is not broken by this procedure. The end of the lower graft may be bent similarly. This gives a better support to the head of the humerus. In children, immobilization of the joint should not be continued for more than six weeks after operation.

ALICE M. MEYERS

Boppe, M.: The Treatment of Simultaneous Fractures of Both Bones of the Forearm (Traitement des fractures simultanées des diaphyses des deux os de l'avant-bras). *Rev. d'orthop.*, 1938, 25: 449.

Boppe discusses the various methods of orthopedic and surgical treatment employed for fractures of both bones of the forearm, and presents the statistics of various orthopedists and surgeons. He reports on cases of recent fracture in adults, 16 of which were treated by orthopedic methods (including 5 open fractures), and 10 by operative methods. Of the 16 patients treated by orthopedic methods, 7 were re-examined several years later, 5 showed a perfect result, 1 a satisfactory result, and 1 a poor result. Of the 10 patients treated by operative methods, 9 were re-examined from one to twelve years after operation, in 8 the results were perfect, in 1 the anatomical result was poor with deformity of the radius, but the functional result was excellent. Among children under fifteen years of age the author treated 25 cases of greenstick fracture, all by closed reduction. He also treated 32 children with transverse fracture of the lower fourth of the bones with marked displacement. Twenty-two of these children were treated by closed reduction with excellent results, 10 by operative measures with perfect results. There were 83 patients with fractures of the diaphysis of both bones in the lower or upper third, of which 67 were treated by closed reduction



Fig 1 Orthopedic reduction of a fracture of both bones of the forearm. Forearm in horizontal position traction on the thumb and fingers



Fig 2

Fig 3

Fig 2 Fracture of both bones of the forearm. External fixation. Retrocubital synostosis

Fig 3 The same fracture two years after a central graft

and 16 by operative reduction. Ten unselected patients in which closed reduction was done under anesthesia were reexamined. 8 had perfect results and 2 had persisting angulation of the fragments. Of the 16 patients with operative reduction 14 showed excellent results, 1 a poor result with radio-cubital synostosis and 1 was not followed up. Of 20 patients with recurrent fracture 3 required operation.

On the basis of his experience with fractures of the two bones of the forearm, the author concludes that immobilization is necessary for from eight to ten weeks in all types of fracture in adults but for not more than six weeks in children with green stick fractures. In transverse and short oblique fractures closed reduction should always be tried, the author prefers manual reduction. This usually gives a perfect or a satisfactory result. The patient must be kept under prolonged observation after closed reduction of such fractures while total displacement of the fragments is rare, angulations are more frequent and should be corrected.

In comminuted spiral or long oblique fractures Boppe considers that operative treatment is the method of choice. Infection is a very rare complication, pseudarthrosis does not usually occur if the physiological relations of the two bones are maintained and if postoperative immobilization is prolonged to nine or ten weeks. In the operative treatment of such fractures in adults the author prefers osteosynthesis by plates fixed with screws but this should be followed by prolonged immobilization. While in children the use of external fixation has been much employed, the author considers that osteosynthesis by some form of bone graft is the preferable procedure.

ALICE M. MEYER

Davidson A. J. and Horwitz M. T. An Evaluation of Excision in the Treatment of Ununited Fracture of the Carpal Scaphoid (Navicular). *Bone Jnn Surg* 1938 105 291

This report deals with 8 cases of fracture of the carpal scaphoid in which total excision was performed in 7 and partial excision in 1. The duration of the symptoms varied from four months to seven years. The results were excellent in 5 and good in 2 of the cases in which total excision was done. In the good results the patients had some residual limitation of dorsiflexion and radial deviation at the wrist but no pain or tenderness.

Indications for fusion as set forth by the authors include the following: (1) fractures that are irreducible even following open operation; (2) badly comminuted fractures of the scaphoid especially those associated with other injuries of the wrist such as a dislocated semilunar bone; and (3) neglected cases of non union and irreparable degeneration of the bony fragments. An additional indication is suggested: cases in which fair but not too prolonged conservative regimen has been tried without healing in which early return to work is imperative.

ROBERT PORTIS M.D.

ORTHOPEDICS IN GENERAL

Kernwein G. Fahy J. and Garrison M. The Fate of Tendon, Fascia and Elastic Connective Tissue Transplanted Into Bone. *Ann Surg* 1933 105 285

The ligamentum nuchae, tendons and fascia lata of dogs and rabbits were transplanted into drill holes in the bones of 6 animals. Thirteen of these experiments and 8 photomicrographs are presented by the authors.

The transplants showed retrogressive changes because of lack of nourishment. There were characterized by an increase in the relative amount of collagen fibers and a decrease in the number and staining quality of the cells.

All transplants remained viable and tended slowly to become ossified. Ossification occurred by an invasion of the transplants by osteoblasts which formed bone and replaced the soft tissue and by



Fig 1 Fascial transplant of sixty days' duration seen passing through cortex of femur of a dog. The cortex (C) borders the defect created by the drill and regionally is devoid of cells. The fascial transplant (F) is being invaded from both sides by osteoblasts and vascularized connective tissue. A large portion of the transplants is already ossified (B). (Courtesy of J. B. Lippincott Co.)

true metaplasia. Greater ossification occurs in the cortex, and it is characterized by an ossification of the transplant. In the medullary region the transplant lies dormant and is walled off from the marrow by a thin bony septum.

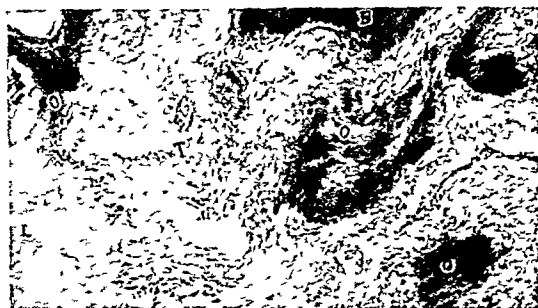
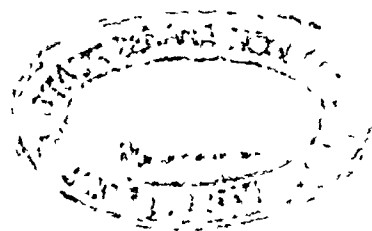


Fig 2 Elastic connective-tissue transplant to femur of sixty-three days' duration. The central portion of the elastic connective tissue (L) is relatively acellular, the periphery (T) contains many cells by virtue of its invasion by a highly vascular connective tissue. Ossification of the invading transplant is seen at (O) and is the work of the many osteoblasts seen in these regions.

The firm anchorage obtained by passing the tendon through drill holes in bones is due to the gradual ossification and incorporation in the bone. Lack of function has no demonstrable effect on these changes.

ROBERT P. MONTGOMERY, M.D.



SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Klein O The Clinical Pathology and Management of Diseases of the Peripheral Circulatory Apparatus (Zur klinischen Pathologie und Behandlung der Erkrankungen des peripheren Zirkulationsapparates) Deutsche tschechoslow. Republ 1935 1 34

Clarification of this subject is of scientific and practical interest to the surgeon Klein differentiates the proximal circulatory apparatus the large medium and small arteries and their corresponding vein from the distal circulatory apparatus the smallest precapillary arterioles capillaries and the postcapillary venules The proximal portion is in general the regulator of the blood pressure Acetylcholin decreases the blood pressure adrenalin increases it The distal portion regulates the local blood supply to the tissues which is independent of the sympathetic nervous system and of the vaso motor centers and depends upon the chemohumoral factors In this portion pituitrin decreases the tonus and tonephrin increases it

Klein distinguishes

- 1 The diseases caused by anatomical changes in the vessels arteriosclerosis endarteritis obliterans thrombo-angitis obliterans and periarthritis nodosa
- 2 The functional diseases vasoneurosis in the narrower sense the spastic-tonic syndrome of the smallest vessels atony of the smallest vessels (capillary atony erythromelalgia) acrocyanosis and Raynaud's disease

The causes may be infectious (typhoid streptococcal I syphilitic) toxic (lead nicotine) allergic constitutional diseases of the sympathetic nervous system or diseases of the endocrine system (disturbances of the digestive glands pancreas thyroid parathyroid hypophysis and adrenal glands) The clinical manifestations depend on the organ involved symptoms in the nervous system include fatigue change of voice headache often of the character of migraine with visual disturbances vertigo or anginoid pains on the side of the organ involved angina pectoris paresthesias and intermittent claudication Objectively circulatory disturbances are frequently demonstrable Important methods of investigation are oscillography oscillography and capillary microscopy The last especially allows differential diagnosis between the various types of vasoneuroses

Of utmost importance is general and special study of the diseases of the individual organs Thus Raynaud's disease may be the only symptom of a latent tetany In the presence of a low blood calcium parathormone should be given In Raynaud's disease and in endarteritis obliterans there is often a tendency toward blood pressure elevation hyperglycemia or glycosuria which show an increase in the function of the adrenalin system

Some severe vasoneuroses react excellently to very potent glandular preparations If they are on a hyperthyroid basis the question of operation or x ray treatment is considered seriously Pharmacologically the cases are strongly influenced by nitrates but their action is fleeting More efficacious is the intramuscular or intravenous injection of papaverine For prolonged management, theobromin or theophyllin natriumacetatum is suitable Certain muscle extracts the potency of which depends on their content of adeno in phosphoric acid such as lacarnol entonon and myosin appear to be good for cases of coronary spasm Kallikrein or padutin has proved to be valuable in long continued treatments The injection of uroselectan or abrodil into the arteries may be repeated every two to four months especially if gangrene has not set in Among the physical methods x ray treatment over the lumbar region and sympathetic ganglia is recommended Hot applications carbonic acid baths the carbonated baths of Coblenz and the suction apparatus are recommended for the milder cases Finally operations on the sympathetic system are to be considered However their results cannot be certain unless the indication is established by preliminary anesthesia of the sympathetic ganglia

(FRANZ) PHILIP SHAPIRO M D

Kulenkampff D The Prevention of Severe or Fatal Emboli by Emptying of the Iliac Vein (Die Verhütung schwerer oder tödlicher Embolien durch Ausräumung der Vena iliaca) 62 Tag d. deutsch. Ges. f. Chir. Berlin 1938

The authors discussed the question of emptying of the iliac vein to prevent severe or fatal emboli on the basis of pictures of the anatomical relationships of the removed thrombi Smaller emboli are much more common than is generally believed Pulmonary complications (pleuritis and bronchopneumonia) postoperative collapse or cardiac arrhythmias may appear If the saphenous vein is exposed under local anesthesia the thrombus is found with a freely floating soft clot in the iliac vein This vein is the source of the severe and fatal emboli The usual and dangerous activities cause the clot to be cut loose by the sharp edge of the ligament

The author reports on 61 cases seen during the last two years There were no recurrences In 12 cases the vein was emptied in 8 the clot was already in the iliac vein In 2 cases the vein was apparently empty The microscope however revealed rests of thrombi In 5 cases the thrombus site was deemed No blood appeared from the peripheral end In the remaining cases the saphena magna was found changed grossly and microscopically Finally there were 5 cases in which after the emptying of broken up disseminated thrombi in one limb there was rapid subidence of the condition Contrary to

the usual assumptions there was no negative pressure in the veins. Artificially produced emboli were never seen.

The narrow forceps should be introduced through the saphenous vein into the iliac vein until no more thrombi are found and the blood flows out in a thick dark stream. Sometimes this stream does not appear until the forceps has removed a thrombus which has settled in front of the femoral vein. The short procedure is ended by ligation of the saphenous vein at the point of insertion, after which a good flow of blood is established.

In the discussion FRUEND reported his studies in 4 cases of thrombosis of the saphenous vein extending into the femoral vein. In 2 cases the saphenous thrombus extended into the femoral and iliac veins and led to a severe embolus. In both cases the mother thrombus was removed from the iliac vein and the vessel ligated. One of the patients subsequently succumbed to the embolus because of a severe cardiac decompensation. In neither case did new emboli develop. Freund's third case was quite similar and was operated upon by Boshammer with complete recovery. In the fourth case the saphenous thrombus reached into the iliac vein. The vein was incised, the thrombus was removed, and the vessel was ligated. Smooth healing took place without the recurrence of emboli. In the first 2 cases operation was performed too late, the thrombus being noticed after four days. By a properly timed operation, as in the fourth case, a massive embolus could have been prevented. It is important therefore, when a thrombus is demonstrated, that operation be done early. Freund sees no disadvantages to ligation of the involved vein because the vein is lost to the circulation anyhow. The ligation prevents further growth of the thrombus and the consequent danger of emboli. Freund stated that the operation on an iliac vein stuffed with a thrombus is perfectly safe and does not elicit the danger of breaking-off of emboli during the process because an increased pressure is always found in the iliac vein which forces the thrombus in the direction of the least pressure, namely to the outside.

MAGNUS said that pulmonary embolus does not arise from the veins of the lower extremity. The period of negative pressure appears in the inspiratory phase. At this time the diaphragm presses down into the abdomen and increases its pressure and likewise the pressure on the veins of the lower half of the body. This is in contrast to the negative pres-

sure in the veins of the upper half of the body during inspiration.

BIEBL operated upon 2 cases of bland thrombosis during the last three months under special circumstances. One case was that of a twenty-four-year-old man with a three-day-old bland thrombus in the axillary vein reaching from the middle of the upper arm to the first rib. The pathogenesis of the thrombus development was clear. A small primary infection in the dorsum of the hand in the form of an abrasion apparently healing uneventfully had given rise to an infectious toxic swelling of the axillary nodes until they were the size of hazel nuts. Their proximity to the axillary vein led to a thrombosis therein. The thrombus then grew in both directions. It was limited to the main vein without extending into any of the branches. The procedure of emblectomy required the opening of the vein at two places because an intervening vein valve interfered with a good cleaning-out of the thrombus masses from one opening. Recovery was uneventful.

The other observation was that of a seventy-three-year-old man, who suddenly developed embolic-like pains in the entire left leg fourteen days after the formation of an artificial anus because of a neglected, high-lying rectosigmoid carcinoma. The leg did not, however, become pale and cold, but only swollen. The clinical picture suggested an arterial spasm secondary to venous thrombosis. On this assumption, Biebl operated immediately. He found a massive thrombus of the femoral vein reaching into the iliac vein where it seemed to end. The saphenous vein and other branches were thrombosed with it. In the exposed artery which was not thrombosed no spasm was found but only a relaxation with minimal pulsation. The spasm of the artery had apparently given place to a period of paralysis. The thrombectomy yielded large masses of thrombi from the opened femoral vein. A large segment of the saphenous vein was resected. The incision in the femoral vein was sutured, the vascular stream was re-established, and no further reactions developed. While the skin was being sutured, however, the patient suddenly died under the clinical picture of pulmonary embolism. Autopsy showed that the thrombus had reached the beginning of the inferior vena cava and had then broken off to give the fatal pulmonary embolus. These cases demonstrate the unanticipated dangers of operation for the removal of venous thrombi.

(KULENKAMPPF) PHILIP SHAPIRO, M D

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Kalmanovskij S M and Zhak E I. Closure of Traumatic Skin Defects *Izvestia khir* 1933 55 375

The author reports the results of 68 plastic closures of traumatic skin defects. In 10 cases pedunculated flap were taken from digits to be amputated and in 9 of them successful results were obtained. Thiersch's method was employed in 41 cases and was a complete success in 36 a partial success in 7 and a failure in 4. Reverdin Davis method of transplantation was used nearly exclusively to cover the stumps of amputated fingers and of 13 such operations 11 were successful while in 2 the graft took only partially. Four times pedunculated flaps were taken from the chest or the spinal region in 2 instances the graft took in 1 a partial and in the last case a complete necrosis developed.

The authors do not apply Thiersch and Reverdin Davis grafts to fresh wounds but wait five days after the excision of the borders. A strict observation of the technical rules without traumatization of the graft is essential for a successful transplantation according to the Thiersch method.

JOSEPH K. NARAY MD

Mahoney E B. A Study of Experimental and Clinical Shock with Special Reference to Its Treatment by the Intravenous Injection of Preserved Plasma. *Ann Surg* 1938 108 18

The term traumatic shock indicates a state of circulatory collapse which follows injury and is characterized by a decrease in the circulating blood volume. This type of shock differs from that due to acute hemorrhage insofar as fluid loss in the latter is due to loss of whole blood while in traumatic shock fluid loss is due primarily to diminution of the blood plasma and only to a minor degree to loss of whole blood. The transfusion of whole blood has been found to be the most satisfactory method of restoring the plasma proteins, the blood volume and the cells in cases of shock due to hemorrhage. In cases of traumatic shock however where there has been no loss of cells and the blood is already concentrated by loss of plasma the transfusion of whole blood adds to the already increased viscosity by increasing the red cells. The use of transfusions of blood plasma in such cases therefore seems more advisable.

The author produced shock in dogs experimentally by cooling the peritoneal cavity. It was then demonstrated that in these animals there was an excessive loss of plasma from the circulating blood and that albumin constituted the major portion of this loss.

Preserved plasma when compared with whole blood saline and ataxia in the treatment of this

type of shock was found to be the most efficient agent in restoring the normal blood pressure. In another set of experiments shock was produced by traumatization of one extremity of the experimental animal. This type of shock was associated with a loss of the red cells and plasma and was more nearly comparable to the shock resulting from hemorrhage. Treatment of this type of shock with preserved plasma was less effective than of the type associated with loss of plasma alone.

The author has used preserved plasma apparently with satisfactory results in shock resulting from burns and from trauma. Since the hemagglutinins are preserved in the processed product it is considered advisable to use only compatible types and always to cross match the dissolved plasma with the recipient's cells.

ARTHUR S. W. TOWNSEND MD

Mastlin E V. The Influence of Pre Operative Medication on Postoperative Complications. *Ann Surg* 1933 10 973

This article is based upon a review of the records of 9,592 operations that were performed at St. Luke's Hospital, St. Louis, Missouri, between the years 1921 and 1936. All of the usual postoperative complications were recorded but only 2 stood out conspicuously, namely the need for catheterization and the subsequent development of cystitis and pyelitis as manifested by pus in the urine. For this reason no cases of genito-urinary disease were included in the study.

All of the cases included in this review received some derivative of opium (morphine, dilauid, pantopon or codein) with either atropine, hyoscine or one of the barbiturates pre-operatively. Tabulations have been prepared which show the complications which occurred after each type of pre-operative medication. The following tables have been reproduced from the original article.

TABLE I — RÉSUMÉ SHOWING THE PERCENTAGE OF COMPLICATIONS FOR EACH GROUP OF OPERATIONS

| Operation | % Cases | Morphine-atropine per cent | Morphine-hyoscine per cent | Morphine-barbiturate per cent |
|-------------------|---------|----------------------------|----------------------------|-------------------------------|
| Thyroid | 40 | 7 | | 5 |
| Breast | 4 | 67 | 38 | 83 |
| Flap | 780 | 3 | 98 | 57 |
| Appendectomy | 33 | 25 | 7 | 28 |
| Gall bladder | 085 | 45 | 33.5 | 36 |
| Gastro-intestinal | 060 | 35 | 27.5 | |
| Pelvic adnexa | 065 | 52 | 58.3 | 56 |
| Hysterectomy | 206 | 27 | 64 | |

TABLE II — RÉSUMÉ SHOWING THE PERCENTAGE OF OCCURRENCE OF CYSTITIS OR PYELITIS AS A COMPLICATION OF 7,901 ABDOMINAL OPERATIONS

| | Morphine-atropine | Morphine-hyoscine | Morphine-barbital |
|---|-------------------|-------------------|-------------------|
| Abdominal operations | 5 324 | 2,318 | 259 |
| Patients catheterized | 923 | 822 | 42 |
| Percentage catheterized | 16.9% | 25.4% | 16.2% |
| Patients with cystitis-pyelitis | 143 | 319 | 6 |
| Percentage with cystitis-pyelitis | 2.7% | 13.7% | 2.3% |
| Percentage catheterized that developed cystitis or pyelitis | 15.8% | 38.8% | 14.3% |

From this study, one is justified in concluding that pre-operative medication definitely influences the postoperative complications, that when morphine and hyoscine are used pre-operatively the percentage of postoperative complications is higher than when morphine is combined with atropine or one of the barbiturates, and that the combination of morphine with one of the barbiturates shows the least number of postoperative complications

JOHN WILTSIE EPTON, M D

Robertson, H A *Clinical Study of Pulmonary Embolism An Analysis of 146 Fatal Cases Am J Surg*, 1938, 41 3

In a careful analysis of 146 fatal pulmonary embolisms the author's deductions are

The average age of the patient was forty-four years. Sex apparently has no bearing on the disorder. Embolism is more prevalent among the overweight than among the lean. No race is immune, but the black man is apparently slightly less susceptible to it. The stodgy and morose individual seems to be more susceptible. Early symptoms were usually so insignificant that they were not recorded. In some instances there was unexplained moderate fever, in others there were frankly infected wounds. Some of the patients had unaccountable pain in the operative site, others had unexplained pain in the leg.

If the main branch of the pulmonary artery is completely blocked by a massive embolus, the blood supply to both lungs is shut off. The patient gasps, becomes pallid, and dies almost instantly. If only partial blocking of the main branch occurs, the patient becomes cyanotic instead of pallid, and faints. Occasionally a severe chest pain with dyspnea is the first symptom. Gradually the partial block becomes complete because a newly formed thrombus accumulates about the embolus. Such patients live for several hours or days. A Trendelenburg operation sometimes rescues the patient. Occasionally, medical treatment effects a recovery.

A careful study of the cases of embolism brought out the fact that trauma was present in every instance. This trauma could be accidental, operative, puerperal, septic, or psychic. The author asserts that in the so-called "medical" pulmonary embolisms, overwork, starvation, prolonged illness, and worry furnished the dull and protracted torture which is more disturbing than actual physical injury.

In discussing the physiology of thrombosis and embolism, the author points out that three factors are involved in the process of coagulation *in vitro* namely, the blood cells, the fluid in which the cells are suspended, and the endothelium in contact with the blood stream. In the normal condition the blood cells are borne freely in a complex suspending medium along an endothelium surface. Thrombosis or coagulation within a vessel can be produced experimentally by altering the normal status of any one of the three factors: the cells, the fluid, or the endothelium. Trauma, either physical or psychic, affects all three of these factors, but not equally in different animals. These changes are apparently provoked by fright, loss of body fluid, and the absorption of catabolic tissue products.

Among the changes possible in the cell constituents are an increase in platelets, an increase in leucocytes, and a decrease in red cells. The plasma may have the following chemical changes: a decrease in the albumin content, and an increase in the globulin content, the lipid content, the calcium content, and the fibrinogen content, and an increase in the carbon-dioxide-combining power.

Thrombosis is definitely related to a disturbance in the coagulation balance. This disturbance is due to changes in blood phenomena, such as marked acceleration of the sedimentation rate of the red cells, increased agglutination and clumping of the platelets, instability of the electric charge of the electrolytic elements of the blood colloids, increased blood viscosity, and shortening of the bleeding and coagulation time. Changes in the blood structure, in the reticulo-endothelial system, or in the blood-vessel walls, have a definite deterrent or accelerative influence upon intravascular clotting. Many theories exist concerning coagulation *in vitro*, all of which presuppose phenomena which explain but cannot as yet be proved.

Some pathologists maintain that progressive thrombosis in the pulmonary artery itself causes the symptoms of pulmonary embolism, and that fatal symptoms arise when and if occlusion becomes absolute. The author maintains that this process does not appear likely because (1) practically all pulmonary emboli exhibit a coiled appearance which could be produced only by churning about in the heart and being thrown forcibly into the pulmonary artery, (2) artificial emboli were produced in dogs by the author and Ronald Hamilton, by the injection of a mixture of ferric chloride and bismuth into the femoral vein, which produced all the classic symptoms of massive pulmonary embolism, and (3) the effect of obstructing the pulmonary artery by

graduated external compression has been repeatedly studied by various investigators who found that complete obstruction caused death but that partial obstruction caused few symptoms.

The author states that it would be difficult to explain the progressively severe symptoms of the patient with an incomplete block of the pulmonary artery on the basis of pulmonary thrombosis alone. Moreover in nearly every case of fatal pulmonary embolism the source of the embolus can be found if enough patience is exerted in the search. Pulmonary thrombosis without embolism is possible but uncommon.

It is definitely established that veins may be contracted by sympathetic stimulation just as the arteries. Moreover cell chemistry is a definite factor in vascular tone. A definite relation exists between cell chemistry, metabolism and the endocrine system. No doubt it is the series of delicate controls and balances between these factors that determine the amount of tolerance in each particular in tance.

With regard to the diagnosis of thrombosis the author states that contrary to the popular misconception that pulmonary embolism originates in a phlebotic area thrombosis occurs without phlebitis except in rare instances. When thrombosis develops in the large veins of the abdomen or the small veins of the uterus or prostate there are few or no symptoms of the thrombosis *per se* but transient mild general symptoms occur. The author states from his own personal observations that restlessness, vague malaise, indefinite discomfort in the legs or abdomen and a psychic slump have preceded embolism by several hours or days.

Of the multitude of tests designed to aid in the diagnosis of thrombosis the author submits three as being practical enough for use in the average hospital. These are the blood coagulation time test, the platelet count and the sedimentation rate of erythrocytes.

Concerning the treatment of thrombosis little can be done once massive thrombosis has set in for embolism in minor or major form then becomes a certainty. If however the thrombophilia can be recognized early it is possible to forestall further thrombosis or permit the minor thrombosis to subside by instituting certain valuable procedures. A low fat low protein diet according to the suggestion of Kugelma's may be given to decrease the clotting factors of the blood. The intravenous injection of 0.5 c.c. of 10 per cent sodium thio sul fate solution each day for three days followed by other series of injections at three-day intervals will decrease the prothrombin and have little influence on the fibrinogen. The patient must be encouraged to become interested in games or in light reading. His fluid intake must be increased, he should be out of bed if possible and his minor complaints should be carefully recorded and sympathetically treated.

The author calls attention to several conditions which bear some similarity to embolism. Atelecta-

sis (from aspiration) is one of these but it appears earlier after anesthesia than embolism or infarction. Usually the atelectatic area can be demonstrated with x rays and confirmed by broncho copy. Spontaneous pneumothorax should not be confused with embolism because of the definite character of the breath sounds and the shifting of the mediastinum which accompany pneumothorax. A roentgenogram of the chest should settle all doubt. Coronary occlusion causes terminal symptoms which are easily confused with those of pulmonary embolism. The same etiological factors are apparently involved. Pulmonary infarction has not the dramatic crash of the massive embolus.

The author recommends the use of papaverine in the medical treatment of these catastrophes. Papaverine is a well known vasodilator. When papaverine is slowly injected intravenously it shortly causes generalized vasodilation including in its action a rather pronounced vasodilation of the pulmonary artery which permits the embolus to be partially dislodged and allows a column of blood to be squeezed past the obstruction. When the jugular veins stand out prominently and pulsate venous section will relieve the right heart of some of its burden. Digitalis in full but not toxic doses may help the laboring right heart. Morphine used sparingly will combat excitement. When all else fails and the patient is comatose an operative removal of the block should certainly be attempted. The Trendelenburg operation is a formidable task with tremendous odds against its success but it is the patient's last chance. Pulmonary infarction offers a much more favorable picture so far as treatment is concerned. Many infarctions heal entirely with no treatment whatever but intelligent treatment must wait upon recognition. Strapping of the chest relieves much of the pain and codeine relieves the cough. Amytal or one of the barbiturates insures rest. Heat has proved very soothing and can do no harm.

Referring to prophylactic measures for the prevention of postoperative pulmonary embolism the author states that most of them have for their basis a stimulation of vascular flow by physiotherapy. The author finds the convalescent exercises of Eugene Pool practical and effective. He supplies a chart for these exercises in his paper. Besides physiotherapy the author strongly urges psychotherapy and vocational therapy.

The true nature of this stigma has never been discovered. An upset of the sympathetic parasympathetic balance of the vascular system through perverted hormone action resulting in sedimentation of blood components normally held in suspension is held to be possible. Carroll twenty years ago stated: Perhaps the blood too becomes old. Many newer theories have failed to come so near the truth. If disease hastens senility it will at least partially explain the relation of infection in the younger and cardiovascular disease in the older patients to thrombosis and embolism. It is possible

that the "wearing out" of the endocrine and hematopoietic systems brings about the abnormal clotting and embolism

MATHIAS J SEIFERT, M D

ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Ramon, G. The Prevention of Tetanus by Means of Serum Therapy and Specific Vaccination (La prévention du tétanos au moyen de la sérothérapie et de la vaccination spécifique) *Mem l'Acad de chir*, Par, 1938, 64 715

Ramon states that the prevention of tetanus by means of antitoxin has been successful, especially in the World War. This method has its limitations, however. While the antitoxin confers almost immediate immunity, this immunity is of short duration. The use of tetanus antitoxin, like that of any foreign serum, may cause serum disease, especially if repeated injections must be given. Certain individuals are especially exposed to tetanus, e.g., farmers, soldiers, and children, and repeated injections of antitoxin after each new injury in such persons involve danger of sensitization. On the other hand, tetanus may develop from minor injuries or from infections of the mucosa, in which the danger is not suspected in time to give antitoxin prophylactically.

Vaccination by means of tetanus anatoxin results in an increase of the antitoxin titer of the blood, and produces an active immunity, which, while it is much more permanent than the passive immunity produced by the serum, takes longer to develop. Repeated determinations of the antitoxin content of the blood in persons vaccinated with anatoxin show that the antitoxin content of the blood is above 1/30 of a unit per c cm in 91.72 per cent eight days after the last injection of anatoxin, in 98 per cent at the end of a month, in 96.4 per cent in ten months, and in 91.48 per cent at the end of a year. In the course of further experimentation with anatoxin vaccination against tetanus, it has been found that a stimulating injection six months or more after the primary vaccination results in a considerable increase in the antitoxin content of the blood. This is of great value in the treatment of a person who is exposed to the danger of infection some time after vaccination with anatoxin. In a person not previously vaccinated, who is exposed to the danger of infection, simultaneous injections of antitoxin and of anatoxin may be given. The passive immunity developed by the antitoxin does not interfere with the development of the active immunity in response to the anatoxin injections.

In France, injections of anatoxin have been used for ten years to protect army horses against tetanus; they have markedly reduced the incidence and the mortality of tetanus in the vaccinated animals as compared with animals not vaccinated. Since then vaccination against tetanus with anatoxin has been made obligatory in association with other forms of vaccination for soldiers in active service in the

French army. It has also been used in other groups, so that more than a million persons in France, including more than 600,000 in the army, have now been vaccinated against tetanus, and not a single case of tetanus has developed among them.

The method advised for vaccination against tetanus is to give 3 injections of anatoxin of 1, 2, and 2 c cm at intervals of three weeks, then a stimulating injection of 2 c cm a year later, or if the person is exposed to infection by injury. Serum is used in prophylaxis only when the person injured has not been previously vaccinated, then an injection of 1 c cm of anatoxin is given shortly before the serum injection and in another part of the body. Fifteen days later a second injection of 2 c cm of anatoxin is given and three weeks later a third injection of 2 c cm.

Tetanus anatoxin can be given in association with other anatoxins and vaccines, such as diphtheria anatoxin or typhoid-paratyphoid vaccine.

ALICE M MEYERS

Abel, J. J., and Chalan, W. Researches on Tetanus. VIII. At What Point in the Course of Tetanus Does Antitetanic Serum Fail to Save Life? *Bull Johns Hopkins Hosp*, Balt., 1938, 62 610

The wash-out experiments previously reported by the authors have shown that only that fraction of toxin which is fixed by the specifically reactive tissues of the body is decisive for life or death. This wash-out procedure disclosed that timely injection of a large amount of antitetanic serum neutralizes fixed toxin and prevents it from being fatal. These experiments have shown conclusively that the toxin of tetanus, as well as its antibody, reaches the central nervous system only by way of the blood stream, which is quite opposed to the belief of Courmont and Doyer, Roux and Borrel, Myer, and others.

In the authors' experiments, these facts were shown.

1. Antitetanic serum exerts a prophylactic effect when injected into dogs that have been poisoned with from 3 to 100 lethal doses of the toxin. When 3 lethal doses are injected, the giving of an appropriate amount of antitetanic serum will save life at any time during the period of incubation, but when more than 3 lethal doses are injected, the life-saving action of serum does not extend throughout the entire incubation period. For example, animals injected with 100 lethal doses can be saved only up to about the fifth hour of the period of incubation.

2. As the interval following the injection of the toxin is prolonged, the amount of antitetanic serum required to save an animal rapidly increases.

3. The life-saving power of antitoxin when injected into toxin-poisoned animals is ultimately dependent upon its ability to neutralize fixed toxin.

In purely local human tetanus of an extremity that shows no signs of tactile reflex symptoms, the timely use of antitetanic serum must be relied upon by the physician as a life-saving substance rather

than a curative agent. In general 30 per cent of all patients with tetanus recover regardless of the use of antitetanic serum but since there is no method to determine at the time the patient presents himself whether his tissues have absorbed and fixed a full lethal dose of toxin who in the present state of our knowledge will venture to decide the inefficacy of antitetanus serum?

The results of the authors' experiments with dogs and monkeys and a critical study of past histories of human tetanus have led the authors to conclude that antitetanic serum is powerless to mitigate or to abolish existing and clearly evident symptoms of a descending tetanus in animal and human beings whose tissues have fixed one or more lethal doses of the toxin before the serum was used. Under these circumstances the serum fails to be life saving and it cannot be thought of as having a specific curative action.

JOHN E. KIRKPATRICK, M.D.

ANESTHESIA

Heard, A. M. The Influence upon Spinal Anesthesia of Certain Characteristics of the Spinal Fluid. *Anes. & Anal.* 1938 17 121

The author reports that in the past few years there has been a definite trend away from spinal anesthesia. This is true probably because spinal anesthesia today must face much keener competition than it did eight or nine years ago when it made its world wide sweep over the methods then in vogue.

The author however believes that another factor is at work in the decrease of the popularity of spinal anesthesia. He believes that this decrease is probably due to the fact that most anesthetists use only procaine to produce the anesthesia. Basing his conclusions upon 6,732 spinal anesthetics carried out at St. Michael's Hospital, Toronto, he believes that pontocaine and nupercaine have a very definite place in spinal anesthesia. With nupercaine anesthesia lasts much longer than with procaine and reactions

are much less severe. As 15 c.cm. of the 1/1300 solution will consistently give about twice as much anesthesia as 150 mgm. of procaine, i.e. in the upper abdomen well over two hours and in the lower abdomen three hours or more. Pontocaine will produce anesthesia lasting between four and five hours in the hip and legs but only about two hours in the abdomen where the level of anesthesia is extremely unreliable. The unreliability of pontocaine he believes is due not so much to the drug as to inherent stages and differences in the spinal fluid of the patient. He finds that the specific gravity of the spinal fluid varies from 1.001 to 1.009. He finds also that there is a very great difference in the pH of the spinal fluid. To make use of these differences in the production of anesthesia he has devised a test by which the relative specific gravity of the anesthetic medium and of the spinal fluid can be determined.

To carry out this test the author extracts 2 c.cm. of spinal fluid. To this are added 4 drops of pontocaine solution from a loaded syringe. If the pontocaine solution diffuses rapidly so that no precipitation is seen a small amount of decinormal sodium hydroxide is added. Observations are then made as to whether the precipitation floats or sinks. This will give an immediate comparison of the specific gravity of the two solutions and will also determine in what position a patient should be placed for the safest and best results.

The author highly commends the use of pontocaine anesthesia in operations below the umbilicus but believes that operations in the upper abdomen should be carried out with nupercaine anesthesia. When nupercaine is used ten minutes are required for the development of anesthesia. During this time the patient should lie on his face and then turn on his back for one or two minutes. This is the method described by Howard Jones in 1930 and has remained a classic procedure.

WILLIAM C. BECK, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Wegelius, C Concerning the Differences Between Radiological and Anatomical Measurements *Acta radiol*, 1938, 19 185

Medical roentgen pictures as shadow projections are misleading both in size and shape, and there is a considerable difference between the radiological and anatomical measurements Errors which are due to a divergence of the rays and enlargement of the shadow, which, while retaining the shape, lengthen the picture, can be calculated and corrected with a considerable amount of precision On the other hand, however, we cannot determine the effect of shadow distortion that is due to the obliquity of the object to the picture plane In contrast to shadow enlargement, a foreshortened reproduction of corresponding distances in the object is produced, and the anatomical measurements are decreased This occurs in varying degrees in different parts, according to the shape and obliquity of the object The reproduction, therefore, will differ in shape from the object accordingly, a distorted picture of the anatomical shape of the object being photographed

The different possibilities of being misled in localization and measuring through this projectional variation are described A process of three-dimensional projection is described by which the misleading shadows are made to take on again the anatomical shape and size of the contour parts They are altered from shadows to real sections These sections can be correctly combined into three-dimensional pictures which then give the delimitation of the object examined in three dimensions Examples are given of the application of the three-dimensional process in the roentgenological determination of the position, size, and shape of internal organs

Paiva Raposo, C, and De Oliveira, I Telerontgenotherapy (Telerontgenterapia) *Arq de patol*, 1937, 9 215

The authors made a long and intensive study of telerontgenotherapy, a technique which was employed for the first time by Teschendorf in the treatment of diseases of the blood and by Mallet in the treatment of malignant tumors This form of roentgenotherapy was employed by the authors for the first time in 1936 in Portugal

The authors describe in general the various therapeutic means which are employed at present in the treatment of carcinoma and discuss critically this relatively new technique of roentgenography, pointing out its principles, its physical and biological features, and its indications and contraindications, as well as the results obtained

The authors furthermore emphasize the importance of the physical aspects of telerontgenotherapy

and define the optimum conditions of the various physical factors, such as focal distance, the extent of the zone of irradiation, the electrical tension, and the filtration They also discuss the influences of these factors upon depth transmission They compare the results obtained with those following ordinary localized radium therapy

In accordance with the findings of other investigators, the authors observed that at a depth of 10 cm there is an increase in the transmission rate of 43 per cent as the focal distance is increased from 50 to 160 cm, the tension and filtration being kept constant They also describe the methods employed at the Portuguese Institute of Oncology, where special equipment is still lacking They use extensive fields of irradiation without any untoward reactions, focal distances varying between 160 and 170 cm, and an electrical tension between 180 and 200 kv, with a filter of 1 or 2 mm of copper

The authors emphasize the absence of cutaneous alterations resulting from telerontgenotherapy They believe that the therapeutic effects are due mainly to an indirect mechanism of action of the actinic rays On the basis of the reports in the literature and their own experience, the authors discuss critically the indications and contraindications of telerontgenotherapy They emphasize the danger resulting from the irradiation of extensive surfaces because of the action of the rays upon the organs of hematopoiesis They insist upon the importance of frequent blood counts

For the treatment of diseases of the blood-forming organs, such as the leucemias and the lymphogranulomas, the authors advise individual exposures spaced well apart (one or two a week) The individual doses are small, never exceeding 15 roentgens, and the body is irradiated through four fields, two on each side

In the treatment of neoplasms, the authors include especially malignancies of the breast which present cutaneous or lymphatic metastases and also osseous metastases For these cases the authors advise more frequent exposures (daily or every other day) with partial doses of from 25 to 40 roentgens corresponding to total doses of from 800 to 1,200 roentgens, the dosage depending upon the number of fields

The authors have treated also a few cases of carcinoma of the cervix (Type IV), but they did not obtain satisfactory results

The patients receiving telerontgenological treatment are watched very carefully and accurate blood counts are made every eight or fifteen days These hematological controls are indicated especially in patients presenting extensive osseous metastases, which often cause a marked decrease in the production of blood

On the basis of their observations, Paiva Raposo and De Oliveira believe that telerontgenotherapy

than a curative agent. In general 30 per cent of all patients with tetanus recover regardless of the use of antitetanic serum but since there is no method to determine at the time the patient presents himself whether his tissues have absorbed and fixed a full lethal dose of toxin who in the present state of our knowledge will venture to decide the inefficacy of antitetanus serum?

The results of the authors experiments with dogs and monkeys and a critical study of past histories of human tetanus have led the authors to conclude that antitetanic serum is powerless to mitigate or to abolish existing and clearly evident symptoms of a descending tetanus in animals and human beings whose tissues have fixed one or more lethal doses of the toxin before the serum was used. Under these circumstances the serum fails to be life-saving and it cannot be thought of as having a specific curative action.

JOHN E. KIRKPATRICK M.D.

ANESTHESIA

Heard, A. M. The Influence upon Spinal Anesthesia of Certain Characteristics of the Spinal Fluid. *Anes & Anal* 1938 17 121

The author reports that in the past few years there has been a definite trend away from spinal anesthesia. This is true probably because spinal anesthesia today must face much keener competition than it did eight or nine years ago when it made its world wide sweep over the methods then in vogue.

The author however believes that another factor is at work in the decrease of the popularity of spinal anesthesia. He believes that this decrease is probably due to the fact that most anesthetists use only procaine to produce the anesthesia. Basing his conclusions upon 6732 spinal anesthetics carried out at St. Michael's Hospital Toronto he believes that pontocaine and nupercaine have a very definite place in spinal anesthesia. With nupercaine anesthesia lasts much longer than with procaine and reactions

are much less severe as 15 c.cm. of the 1/1500 solution will consistently give about twice as much anesthesia as 150 mgm. of procaine, i.e. in the upper abdomen well over two hours and in the lower abdomen three hours or more. Pontocaine will produce anesthesia lasting between four and five hours in the hip and legs but only about two hours in the abdomen where the level of anesthesia is extremely unreliable. The unreliability of pontocaine he believes is due not so much to the drug as to inherent stages and differences in the spinal fluid of the patient. He finds that the specific gravity of the spinal fluid varies from 1.001 to 1.009. He finds also that there is a very great difference in the pH of the spinal fluid. To make use of these differences in the production of anesthesia he has devised a test by which the relative specific gravity of the anesthetic medium and of the spinal fluid can be determined.

To carry out this test the author extracts 2 c.cm. of spinal fluid. To this are added 4 drops of pontocaine solution from a loaded syringe. If the pontocaine solution diffuses rapidly so that no precipitation is seen a small amount of decinormal sodium hydroxide is added. Observations are then made as to whether the precipitation floats or sinks. This will give an immediate comparison of the specific gravity of the two solutions and will also determine in what position a patient should be placed for the safest and best results.

The author highly commends the use of pontocaine anesthesia in operations below the umbilicus but believes that operations in the upper abdomen should be carried out with nupercaine anesthesia. When nupercaine is used ten minutes are required for the development of anesthesia. During this time the patient should lie on his face and then turn on his back for one or two minutes. This is the method described by Howard Jones in 1930 and has remained a classic procedure.

WILLIAM C. BECK M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

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The patients receiving teleroentgenological treatment are watched very carefully and accurate blood counts are made every eight or fifteen days. These hematological controls are indicated especially in patients presenting extensive osseous metastases, which often cause a marked decrease in the production of blood.

On the basis of their observations, Paiva Raposo and De Oliveira believe that teleroentgenotherapy

yields the best results in the treatment of carcinoma of the breast with generalized metastases. The results are unquestionably far superior to those obtained from the irradiation of small fields. The effect of this therapeutic method upon extensive epitheliomas is less encouraging but nevertheless it should be tried in all cases in which local irradiation proves to be valueless.

Concerning the mode of action of teleroentgenotherapy the problem still remains obscure and a great deal of further research work is needed to clarify it.

RICHARD E. SOMMA, M.D.

MISCELLANEOUS

Mortara, F. *The Action of Short Wave Therapy upon the Female Mammary Gland* (Azione delle onde corte sopra la mammella) *Riv. ital. di ginec.* 1938 21 221

Mortara states that in recent years short wave therapy has found an increasingly wider field of application in medicine. Stimulated by the research work of other investigators on the treatment of some pathological conditions of the breast with short wave therapy the author extended these studies by observing the effects of these waves upon the normal mammary gland.

The experiments were performed on three groups of female rabbits in the prepubertal stage and also on two groups of adult female rabbits in full sexual activity but definitely not pregnant.

Mortara also used a third group of animals which prior to exposure to short wave therapy were treated with decidua extracts in order that the breast develop to a certain degree of functional activity. The treated breasts were subsequently removed and studied histologically and the preparations were compared with corresponding preparations derived from untreated control animals. The animals were exposed daily to short wave therapy over a period of ten days. The dose was gradually increased. In general the animals tolerated the treatment well with the exception of one rabbit which presented signs of polyneuritis.

In the normal sexually inactive animal the breast tissue is almost entirely made up of the nipple which is generally small. A few small lactiferous ducts may be recognized in cross sections. In the pregnant state however the glandular tissue appears and the organ reaches its maximum development by the time of lactation. At this stage cross sections reveal the presence of numerous glandular lobules. The nipple becomes markedly enlarged and the lactiferous ducts are greatly dilated.

Animals treated with short wave therapy presented during the course of the treatment a hypertrophy of the nipple and a dilatation of the lactiferous ducts. With continued exposures to the short waves these changes became more accentuated. It also appeared that the results obtained depended upon the wave length, better results being obtained with shorter waves.

The best results were observed in those animals which had received small doses of decidua extract prior to the short wave treatment. In these animals histological examination revealed the presence of veritable glandular lobes. The nipple became maximally enlarged and the lactiferous ducts were greatly dilated.

Following discontinuation of the treatment the mammary gland underwent gradual retrogressive changes and histological examination showed the formation of newly formed connective tissue surrounding the lactiferous ducts and the blood vessels.

Mortara believes that all the aforementioned changes are primarily due to short wave therapy with the exception perhaps of those observed in the animals which were treated with decidua extract.

The author concludes that short waves exert a veritable biological action upon the various organs. This specific effect combined with the thermic factor produces an active hyperemia which enhances the functional activity of the organ.

Mortara believes that short wave therapy may be used advantageously in the treatment of deficient or absent milk secretion in human beings.

RICHARD F. SOMMA, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Hall, B E , Hargraves, M. M , Watkins, C H , and Giffin, H Z Emergencies Arising in the Anemias and Blood Dyscrasias *Med Clin North Am* , 1938, 22 907

The author discusses emergencies arising from the acute loss of blood and from various blood dyscrasias. No attempt has been made to elaborate fully on these conditions, the purpose having been rather to present the salient points in the differential diagnosis and treatment, especially in the case of diseases presenting somewhat similar pictures.

ANEMIAS

Anemia due to loss of blood The symptoms which develop with acute hemorrhage are dependent upon the reduction of the blood volume. The loss of a third of the blood in the course of a few hours may result in syncope and death, whereas the loss of half or two-thirds of the blood within the body over a period of twenty-four hours or longer may not be fatal. With subsidence of the hemorrhage, fluid passes from the tissues of the body into the blood stream in an attempt to restore the blood volume. The blood picture of acute posthemorrhagic anemia is one which reflects increased regenerative activity of the bone marrow. After a severe hemorrhage, the peripheral blood gradually returns to normal in from four to eight weeks. Recovery may be retarded when the iron stores in the body are depleted, when the diet is deficient in iron, or when chronic infection is present within the body.

In most cases the clinical history will reveal the source of the hemorrhage. The authors cite cases in which the source of the hemorrhage was obscure. The immediate treatment consisted in an attempt to control the bleeding and in an attempt to replace the diminished volume of blood with fluid. Blood is the fluid of choice. Indications for blood transfusion are signs of a decreased blood volume and a rapidly falling erythrocyte count. In emergencies physiological saline solution, glucose solution, or acacia solution may be given intravenously. The quantity of blood or other fluid, and the rate at which it is given depend upon the source of the bleeding.

The hemolytic anemias Increased destruction of the blood is evidenced by an increase in the quantity of pigments derived from the hemoglobin in the blood plasma and in the feces, the appearance of these pigments in the urine, jaundice, and signs in the peripheral blood of increased regenerative activity of the bone marrow. Increased hemolysis may be due to extrinsic or intrinsic factors.

The extrinsic factors are (1) infection, increased destruction of the blood is not uncommon in infec-

tions of various kinds but it is usually of minor significance (the authors cite a few diseases in which destruction of the red cells may become important) and (2) chemicals and drugs, a large number of chemical substances cause excessive destruction of the erythrocytes, these are principally occupational hazards (such substances include phenylhydrazine, aniline, nitrobenzol, trinitrotoluol, potassium chlorate, and a multitude of others).

PAUL MERRELL, M D

Osgood, E E , and Brownlee, I E · Culture of Human Marrow. A Comparative Study of the Effects of Sulfanilamide and Anti-Pneumococcus Serum on the Course of Experimental Pneumococcal Infections. *Arch Int Med* , 1938, 62 181

By use of the vaccine-vial method of culturing human marrow, carefully controlled studies were made to determine the mode of action of sulfanilamide and anti-pneumococcus serum on experimental infections with pneumococci.

The following are the authors' conclusions:

Culture of human marrow makes possible a type of control that is not attainable either in animal experimentation or in clinical investigation. In human-marrow cultures, sulfanilamide exhibits a slight bacteriostatic action on pneumococcal infections which is increased by an increase in concentration. Even 0.3 unit per cubic centimeter of specific anti-pneumococcus serum is more effective against the Type I pneumococcus than sulfanilamide alone. Sulfanilamide plus any given dose of antiserum that is less than the amount which will by itself reduce colony counts to nearly zero is more effective than corresponding doses of antiserum alone.

These effects do not depend chiefly on phagocytosis. The results support the view that sulfanilamide renders the organism more vulnerable to bactericidal substances that are present in the serum. If the results of these *in vitro* experiments on the interaction of therapeutic and noxious agents, in the presence of living human cells, are applicable to infections in human beings, sulfanilamide therapy should be of value in pneumococcal pneumonia, and might delay death in cases of patients with pneumococcal meningitis, but it will not prove as effective as even small amounts of type-specific antiserum. If used in conjunction with the present dosage of antiserum it should further lower the mortality, or it should give an equally low mortality with smaller doses of antiserum.

The use of both sulfanilamide and therapy designed to introduce or develop specific bactericidins should be investigated further as a possibly effective treatment for infections which are relatively resistant to the action of sulfanilamide alone.

JOHN H GARLOCK, M D

Shear M J Studies in Carcinogenesis V Methyl Derivatives of 1,2-Benzanthracene *Am J Cancer* 1938 33 499

Of 21 compounds which were examined for carcinogenic activity by subcutaneous injection into pure strain mice 20 were found to produce tumors at the site of the injection

Subcutaneous tumors were produced in mice by the injection of 5,10-dimethyl 1,2-benzanthracene about as rapidly as by cholanthrene which shows that the pentacyclic system of the latter is not essential for high carcinogenic potency

Subcutaneous tumors were produced by the injection of 10-methyl 1,2-benzanthracene almost as rapidly as by the 5,10-dimethyl derivative The production of the skin tumors by 10-methyl 1,2-benzanthracene with the skin painting technique was lower than the production of subcutaneous tumors with the injection technique

Tumors were produced by 5,9-dimethyl 1,2-benzanthracene about as rapidly as by cholanthrene

The 9-methyl derivative was also found to be a potent carcinogenic agent but its latent period was longer than that of the 5,9-dimethyl derivative

The 4,10-ace derivative was found to be carcinogenic especially in small doses and it did not produce severe local tissue damage

The 1,2,3,4-tetrahydro derivative of 4,10-ace 1,2-benzanthracene was also carcinogenic

Ethylcholanthrene produced tumors in a high proportion of the mice but it was more slow of action than 20-methylcholanthrene or cholanthrene

No tumors were produced by the administration of 5-triphenylbenzene even after a period of twenty months

JOSEPH K. NARAY MD

DUCTLESS GLANDS

Hilaw F L and Greep R O The Inhibition of Uterine Bleeding with Estradiol and Progesterone and Associated Endometrial Modifications *Endocrinology* 1938 23 1

Castrated adolescent monkeys given 500 R U of estrin daily for twenty days will bleed soon after discontinuance of the treatment Such uterine bleeding is not postponed beyond the expected time by 25 R U of estrin daily or by $\frac{1}{4}$ Rb U of progesterone daily Bleeding is inhibited for from nine to ten days by 50 R U of estrin daily One-half Rb U of progesterone daily will postpone bleeding for from eight to thirteen days $\frac{1}{4}$ Rb U for from fifteen to twenty five days and 1 Rb U for as long as forty four days after which bleeding will occur within from four to seven days if the dosage is reduced to $\frac{1}{4}$ Rb U daily When estrin and progesterone are injected simultaneously 25 R U plus $\frac{1}{4}$ Rb U daily will inhibit bleeding for from eight to fourteen days 25 I U plus $\frac{1}{4}$ Rb U for at least twenty four days and 50 R U plus $\frac{1}{4}$ Rb U for at least twenty eight days Fifty I U plus $\frac{1}{4}$ Rb U were given for as long as twenty two days without indications of bleeding

Amounts of progesterone which do not inhibit bleeding long enough to permit the development of a premenstrual endometrium when given alone following an estrin treatment will produce a premenstrual reaction when given in conjunction with a suitable dosage of estrin Fifty R U of estrin plus $\frac{1}{4}$ Rb U of progesterone daily will elicit a definite premenstrual reaction within twenty two days while 25 or 50 R U plus $\frac{1}{4}$ Rb U daily for the same length of time will produce a fully developed premenstrual condition Bleeding from the endometrium in such cases is not postponed by 50 or 100 R U of estrin daily but may be inhibited by 500 R U daily When bleeding from endometrium which has undergone premenstrual development is inhibited by estrin (500 R U daily) the condition is changed back into that which is typically responsive to estrin action Such endometrium may be again transformed into a premenstrual state by the administration of 100 R U plus 1 Rb U daily after which bleeding cannot be inhibited by 500 R U of estrin daily Thus endometrium showing the effects of estrin can be changed to a premenstrual state back to a state of estrin response and again to a premenstrual condition without the intervention of bleeding

Considerable glycogen is found in the uterine glands when 100 R U of estrin is given daily for twenty days or longer and when larger doses are injected for the same period of time there is a correspondingly greater deposition of glycogen Although the epithelial cells may contain an abundance of glycogen as a result of the action of estrin very little is released into the lumina of the glands at least in a stainable form In contrast with the progesterone produces both the formation and release of glycogen The discharge of glycogen from the glandular epithelium reaches its height during the secretory phase and decreases as the endometrium approaches the condition of secretory exhaustion

Both estrin and progesterone produce a deposition of glycogen in a few large cells scattered throughout the stroma Such cells are very few when 100 R U of estrin is injected daily for twenty days but are always present following treatment with larger doses of estrin progesterone or a combination of the two hormones

CHARLES BARON MD

Kenyon A T The Effect of Testosterone Propionate on the Genitalia Prostate Secondary Sex Characters and Body Weight in Eunuchoid *Am Endocrinology* 1938 23 121

Four eunuchoid patients were given subcutaneously from five to seven times weekly 25 mgm of testosterone propionate in sesame oil over a period of from twenty eight to ninety nine days Thereafter 3 of the patients received from 10 to 25 mgm of testosterone propionate from three to seven times weekly with interruptions until from the one hundred and eight to the one hundred and sixty third day There was an early increase in erection and an enlargement of the prostate in all of the patients an

enlargement of the penis and an increase in the sexual hair in 3, and a distinct deepening of the voice in 2. The size of the testes was unaltered in 2, but the sperm disappeared during treatment in 1 of these and reappeared later. Hypertrophy of the breast tissue occurred in 1 patient. There was a marked increase in the body weight of all 4 patients, accompanied, in 2, by an increased appetite, and by evident edema in the 2 others. There was a slight increase in the basal metabolism in 1 patient.

CHARLES BARON, M D

HOSPITALS, MEDICAL EDUCATION AND HISTORY

Brodsky, I - The Trephiners of Blanche Bay, New Britain, Their Instruments and Methods. *Brit J Surg*, 1938, 26, 1

A recent contribution by Brodsky gives an interesting detailed account of a primitive operation, that of trepanation, as practiced by the natives of the Blanche Bay district, New Britain, in the South Sea Islands. The information gleaned from a perusal of this paper throws some light on the history of trephining, and ultimately on the history of surgery, since trephining is as old as surgery itself. The evidence of prehistoric trephining stands conclusive, though the reasons for the institution of the measure must remain a moot question. Trephining as practiced by the natives of Blanche Bay bears some relation to Shamanism. In the first place, the operation is performed by the *tene a babait*, the wizard or "healer," literally, "the one who is skilled in healing." There is here a significance other than therapeutic. In the second place, Parkinson in a review of thirty years' work in the South Seas, says that charms, *mailan* and *aurur*, are hung on the patient in order to insure healing.

Considering the fact that these primitive trepanations were undertaken with no precise knowledge of brain function, anesthesia, or asepsis and brought

to a successful termination with a remarkably small mortality rate, we must indeed feel considerable respect for these primitive surgeons. Hudson's figures show a mortality of 75 per cent in 32 trephining operations carried out at St. George's and Guy's Hospitals during the period from 1870 to 1877. In sharp contrast to this we find the estimates of Crump and Parkinson who claim that over 70 per cent survived the operations performed in the Gazelle Peninsula and the neighboring Duke of York Islands. Thus these primitive native surgeons with their crude methods were ahead of their English contemporaries at that time.

An analysis of primitive methods may well permit scientific guesses regarding some of the steps intervening between Shamanism and surgery. In this particular case the knowledge of technique corresponds in a manner to that of a Stone Age of our own more refined technique.

Intertribal skirmishes were frequent nearly sixty years ago in the Blanche Bay district. The issue was often decided by sling-stone warfare. Stones were thrown with great force and accuracy, frequently resulting in skull fractures. Frontal and parietal fractures were common, though occipital fractures sometimes occurred when discretion made retreat imperative. The *tene a babait*, or medicine-man, made the selection of cases suitable for operation. When extensive cerebral damage occurred the case was rejected. For his instruments he used the following:

1. The *V1*, or knife, consisting of a piece of bamboo, cut tangentially and so shaped as to provide a double cutting edge in the upper two-thirds of its total length, while the lower and wider third constituted the handle.

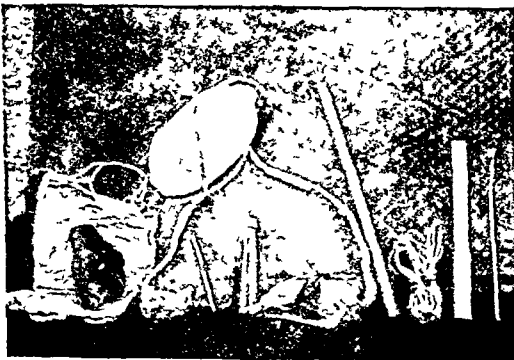


Fig 1 The full range of instruments and materials used in trephining by the natives of Gazelle Peninsula, New Britain

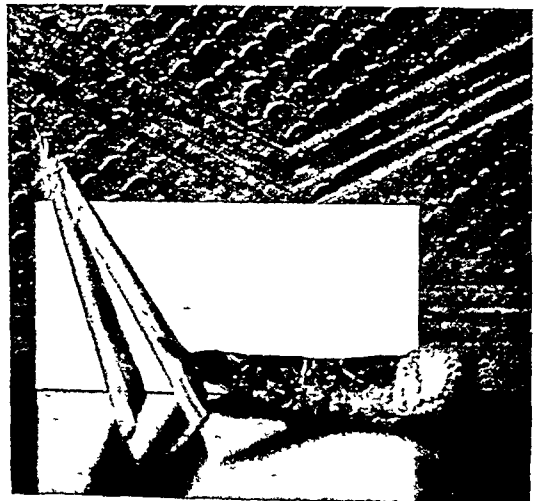


Fig 2 *Kia* (two types) (i) forceps, (ii) scoop

2 The *Koto*, or scraper made of an irregularly shaped piece of igneous rock with sharp edges

3 The *Kaur* or blowpipe consisting of a hollow bamboo cylinder

4 The *Kia* of which there were two types

a The forceps consisting of a narrow strip of bamboo doubled over to form a pair of forceps

b A piece of coconut shell fashioned to form a scoop

5 The *Takam* or needle made of the sharpened hollow wing bones of the flying fox

6 The *Kuara* or *Ayaya* corresponding to our thread. The author illustrates two specimen samples of double ply threads in sizes corresponding to No 5 catgut and 000 catgut (British Imperial wire gauge standard). The thread is made from banana fiber the shoot being split lengthwise the inside well scraped and then dried in the sun (Figs 1 and 2).

After carefully washing the wound with the young milk (trip) of a Makadai coconut the *lene* a *babai* made a triangular incision over the site of the fracture. While trip was being continuously poured over the wound the tissues were scraped away with a *Koto*. The *Kaur* was next used to blow inside the wound in an attempt to locate the spicules of bone. These were picked out with the *Kia* while scraping and blowing were continued until all pieces were removed. Then the skin was coapted with needle and thread. Following this elaborate dressings were placed in position.

A *lagete* leaf was first placed over the wound. Over this was put *pala palao* the outer layer of the banana flower. Next a mixture of pepper lime and very soft young betel nut (*aimim*) which had been chewed together called *meme na bnat* was spread over the first layers to exclude air. The entire head was covered with *tara leaf* (*Kumu*) and big round leaves of a bush (*paba*). Finally the *malan* was tied on. This was an oval dressing pad of *mal* which is obtained from a small branch of a tree *mal tuna*. It is backed by two pieces of leaf and at each end a plaited strap of *rotang* is firmly attached.

If the operator found that there had been a slight damage to the brain he would not hesitate to scoop out the traumatized portions. The hole was plugged

with a piece of red *mal* which was retained permanently. White *mal* from the tree *mal tuna* was wrapped over the wound and left there until it healed. Soft food was given to the patient after the operation with a view to minimizing the movements of the jaw and keeping the head quiet. After three days the dressings were removed. If pus was found present the sutures were removed and the operation was repeated with a fresh application of dressings. After about a week's time the patient was given a piece of old coconut to chew. If no pain was felt this was accepted by the healer as evidence that healing had taken place and that fragments were no longer present.

Three descriptions of this operation have been published. The first to communicate his observations was the Rev J A Crump. Following this a German surveyor R Parkinson recorded his experiences. The third account was published by the author in 1936. Recently Edward Ford has reviewed the literature dealing with trepanning in Melanesia and has recorded details and photographs of a trepanned skull obtained from the Blanche Bay district.

The variation which occurs in the various accounts may be explained on the grounds that observations were made in different areas. It is unthinkable that the technique would be rigidly uniform. Even in our own experience a given procedure varies with the school, the district, the type of case and the operator.

Parkinson points out that in the southern half of New Mecklenburg (New Ireland) they have advanced still further in surgical practice in that they call on trepanning for certain illnesses and to relieve pain.

Viewing this primitive operation in the light of our modern surgery we must admit that the steps of the operation appear surprisingly orderly. An examination of the instruments used by the *lene* a *babai* increase our respect for his ingenuity. In passing the author calls attention to the fact that it has been left to missionaries, anthropologists and lay observers to uncover this illuminating segment in the history of surgery.

MATTHIAS J SEIFERT M.D.

INTERNATIONAL ABSTRACT OF SURGERY

MARCH, 1939

SURGERY AND THE BASIC SCIENCES

THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

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MINERAL METABOLISM

MAGNESIUM Until recent years very little has been known about the symptoms produced by a dietary deficiency of magnesium. In 1932, Kruse, Orent, and McCollum (1) reported that rats maintained on a practically magnesium-free diet exhibited marked vasodilatation and hyperemia of the skin, hyperirritability of the nervous system, cardiac arrhythmia, and finally tetany characterized by tonic-clonic convulsions, which frequently terminated fatally. The erythema served to clearly distinguish this type of tetany from that produced by a reduction of the blood calcium level. Orent, Kruse, and McCollum (2) also demonstrated that dogs, when maintained on a magnesium-free diet, manifested symptoms which differed from those mentioned only to the extent that they were more chronic, and that trophic and nutritional disturbances were accordingly more prominent. A study of the changes in the chemical composition of the blood in such animals (3) revealed a marked fall in the magnesium concentration without detectable changes in the calcium concentration or carbon-dioxide combining power. These findings definitely differentiated magnesium tetany from calcium tetany. The level of cholesterol esters in the blood was observed to be elevated by 100 per cent or more. The bones were found to contain an abnormally high concentration of calcium (4). Brook-

field (5), Tufts and Greenberg (6), and Schrader, Prickett, and Salmon (7) have confirmed the finding that animals on a magnesium-deficient diet develop a characteristic tetany. Greenberg, Lucia, and Tufts (8) have studied the changes in kidney function in rats chronically deficient in magnesium. They observed that the animals eliminated an increased volume of urine containing albumin but neither blood nor casts. The blood-protein concentration diminished progressively to the edema level. In the early stages histological examination of the kidneys revealed degenerative changes in the tubules, in the later stages deposits of calcium were identified in the cortex and pyramids. These authors describe these changes as being typically nephrotic. Schrader, Prickett, and Salmon (7) noted mild degenerative changes in the renal tubules, and more severe degeneration in the liver. In the latter organ the cells exhibited a marked foaminess of the cytoplasm. The findings of hypercholesterolemia, reduced blood-protein concentration, edema, albuminuria without hematuria, and degenerative changes in the renal tubules rather closely resemble the findings in clinical lipoid nephrosis, calcification of the kidney is the only discordant finding, but it has not been observed by all investigators.

According to Moore, Hallman, and Sholl (9), magnesium deficiency in calves results in the deposition of calcium in the yellow elastic fibers of the heart, the large blood vessels, and the spleen, and

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in the Purkinje fibers. They consider the possibility that magnesium deficiency may play a rôle in the etiology of arteriosclerosis. Rubin and Rapoport (10) reported that administration of magnesium salts reduces hypertension produced experimentally in rats by ergotamine tartrate.

Magnesium deficiency in man is probably a rare condition inasmuch as this element is widely distributed in food stuffs. Hirschfelder (11) however has described 10 cases of low blood magnesium in which symptoms of neuromuscular hyperirritability were evident.

Potassium and sodium. In view of the recently discovered importance of potassium and sodium ions in the control of adrenocortical insufficiency it is of interest to know the possible effects of exclusion of these elements from the diet. Schrader, Prickett, and Salmon (7) have recently investigated the effects produced by a deficiency of potassium in the diet in rats. The animals became lethargic and abdominal distention became progressively more marked. The skin became pale and somewhat cyanotic and the hair short and fur like. The lethargy progressed to coma and finally death intervened. At necropsy the abdominal cavity showed marked pathological changes. Severe ascites and occasionally hydrothorax and hydropericardium were noted. The intestinal tract was enlarged, congested, edematous and atonic. Intussusceptions sometimes as many as four in one individual were found in the majority of the animals. The kidneys which were large and pale showed tubular degeneration. Massive erosions almost perforating the cardiac wall were seen in the ventricles of the heart.

Pathological changes in the eyes were noted by Orent, Keiles, Robinson, and McCollum (12) in rats which had been maintained on a diet deficient in sodium. Corneal ulceration, hypopyon, hemorrhage, bulbar and ciliary injection and keratinization were found in the eyes of these animals. It was shown that these changes were not related to a Vitamin A deficiency. The female animals suffered disturbances in the estrus cycle. Kahlenberg, Black, and Forbes (13) have shown that rats on a diet partially deficient in sodium develop anorexia and fail to grow and store energy producing materials.

The diets employed in these experiments contained only minute amounts of sodium or potassium. Diets deficient to such a degree would probably never be encountered clinically.

Calcium and phosphorus. Calcium and phosphorus in contrast to the minerals discussed above are not uncommonly deficient in the ordinary American diet. Day, Kruse, and McCollum

(14) have shown that dogs maintained on a practically calcium free diet develop alternate diarrhea and constipation, edema, osteoporosis with bone deformities, lethargy and anorexia. Death results from inanition. The blood-calcium level may fall to tetany levels and acidosis commonly appears.

According to Goss and Kleiber (15) phosphorus deficiency in rats results in retarded growth, impaired appetite and irregular or absent estrus. In heifers, Kleiber, Goss, and Guilbert (16) reported failure of growth and appetite and impaired efficiency in the utilization of energy with a marked fall in the blood phosphorus level.

The usual method of producing experimental rickets has been to feed a diet low in phosphorus, high in calcium and deficient in Vitamin D. During recent years numerous reports have appeared which demonstrate that the available phosphorus of an adequate diet may be reduced to the rachitogenic level by the addition of certain metallic compounds, the phosphate salts of which are insoluble and therefore absorbed only incompletely and with difficulty. The salts of aluminum (Deobald and Elvehjem, 17; Cox, Dodds, Wigman, and Murphy, 18; Jones, 19), iron (17, 18; Brock and Diamond, 20), beryllium (Gayatt, Kay, and Branion, 21), strontium (19) and manganese (Blumberg, Shelling, and Jackson, 22) when incorporated in the diet are capable of producing what has been called metal rickets in rats. The development of metal rickets may be completely prevented by the addition to the diet of a quantity of phosphates which is more than sufficient to chemically combine with the rachitogenic metallic ion. These findings may be of some clinical interest in view of the practice of administering massive doses of iron for the control of secondary anemia. Probably of even greater significance are the possible undesirable effects which might attend the long continued administration of aluminum hydroxide preparations in the treatment of chronic ulcers.

Although low phosphorus, high calcium diets have usually been employed for the production of experimental rickets, Shohl and Wollbach (23) have demonstrated that rickets may be produced by a diet the calcium-phosphorus ratio of which have been altered in the opposite direction. In fact they have shown that a diet with any calcium-phosphorus ratio may become rachitogenic when the absolute amounts of these elements are sufficiently reduced. Shohl (24) has recently reported that to a limited extent a given diet can be made rachitogenic or more rachitogenic by the addition of a mixture of ammonium chloride

and ammonium carbonate in order that the diet have an acid residue. On the other hand, the reverse effects may be produced by the addition of a mixture of citric acid and sodium citrate which maintains an acid reaction in the intestine during absorption and yields an alkaline residue. These results demonstrate the influence of the acid-base balance on the utilization and retention of calcium and the experimental production of rickets. The rôle of Vitamin D is apparently the widening of the non-rachitogenic range of abnormality in the calcium and phosphorus contents of the diet.

Some years ago Albright and Elsworth (25) advanced the theory that the primary action of the parathyroid hormone is to promote the urinary excretion of phosphorus. This effect was found to reach its peak long before the serum calcium became elevated. They suggested that the loss of phosphorus in the urine tends to lower the blood-phosphorus level, that this, in turn, causes the bone salts to dissolve and thus supply excess calcium to the blood. Albright and Sulkovitch (26) have recently suggested that Vitamin D has two physiological actions. Its predominant action is to promote the intestinal absorption of calcium. The second action, which is not anti-rachitic and which becomes manifest only when large doses are administered, is to promote the urinary excretion of phosphorus. This parathormone-like action provided an explanation for the limited usefulness of Vitamin D in the control of parathyroid deficiency. Albright, Bloomberg, Drake, and Sulkovitch (27) have also investigated the mode of action of a new sterol compound chemically related to Vitamin D, which is known as dihydrotachysterol, or A T₁₀. This compound, which is not anti-rachitic, was found to possess to only a slight extent the property of increasing the intestinal absorption of calcium. It was found to be very effective in the promotion of urinary excretion of phosphorus and the elevation of calcium concentration of the blood. On the basis of these results Albright *et al.* explain the effectiveness of the compound in the control of parathyroid deficiencies.

The irradiation of ergosterol gives rise to a series of compounds lumisterol, tachysterol, Vitamin D, toxisterol, and suprasterols. Only Vitamin D possesses anti-rachitic properties. Toxisterol was a contaminant of certain irradiated ergosterol preparations marketed years ago and this substance was responsible for the marked toxicity of these preparations. Tachysterol can be chemically converted to dihydrotachysterol, a form suitable for peroral administration. It was found by Holtz, Gissel, and Rossman (28) to be very effective and convenient for the control of

parathyroid tetany. Numerous favorable clinical reports have appeared mainly in the German literature, which claim the drug to be effective not only in hypocalcemic states, but in a variety of unrelated conditions. (For a complete review and bibliography see Albright *et al.*, 27). Like parathormone the drug manifests toxicity when employed in excessive doses. Presumably the administration of adequate amounts of saline solution should counteract the toxic symptoms of dihydrotachysterol as effectively as those of parathormone (see previous review of this series, 29).

Minerals and hemoglobin formation. Balance studies in man have yielded some interesting information in regard to the retention and utilization of administered iron salts. Fowler and Barer (30) and Brock and Hunter (31) have shown that although large amounts of inorganic iron may be absorbed from the intestines and retained, only a small fraction is utilized in the formation of hemoglobin. McCance and Widdowson (32) have recently reported that parenterally administered iron is not excreted by the intestine. On the basis of this finding they suggest that the intestine does not have the power to regulate iron elimination.

In an earlier review of this series (33) it was mentioned that Beynon (34) had claimed that copper aided hemoglobin regeneration, not by assisting in the conversion of iron to hemoglobin as generally believed, but by preventing constipation and its consequent interference with general nutrition. Black, Kahlenberg, Bratzler, and Forbes (35) have presented evidence which contradicts this assertion. They found that rats on a diet deficient in iron and copper digested more of the ration and produced more heat than control animals which were forced to consume the same quantity of food.

Potter, Elvehjem, and Hart (36) have shown that accelerated hemoglobin production in dogs is accompanied by an increase in the copper concentration in the blood. They also showed that dogs must be included as one of the large number of animals which require copper for hemoglobin regeneration. This finding may necessitate a reinterpretation of Whipple's evidence for the existence of a principle contained in liver which is potent in the treatment of secondary anemia. In 1935 Robschert-Robbins, Walden, and Whipple (37) assayed various fractions, obtained from liver, kidney, spleen, and cardiac muscle, for their potency in promoting hemoglobin regeneration in dogs rendered chronically anemic by means of frequent bleeding. They found no correlation between the potencies of these various fractions and their total iron content. No distinction be-

in the Purkinje fibers. They consider the possibility that magnesium deficiency may play a role in the etiology of arteriosclerosis. Rubin and Rapoport (10) reported that administration of magnesium salts reduces hypertension produced experimentally in rats by ergotamine tartrate.

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and Foshay (52) in 1935 had previously reported that wound healing was promoted by urea solutions. Millar in 1933 (53) had shown that treatment with urea suppresses the foul odor of sloughing cancerous lesions. It is well known to biochemists that strong urea solutions are excellent solvents for protein material, both natural and denatured. Since Robinson's work appeared several reports have confirmed the value of urea solutions in the treatment of wounds (Holder and McKay, 54, Bogart, 55, Baker, 56, Muldavin and Holtzmann, 57). Most of the later workers agree that concentrated solutions or even crystals of urea are superior to the dilute solution employed by Robinson. The advantages of the method of treatment are its cheapness, simplicity, and its freedom from toxicity and irritation.

An entirely different series of investigations have revealed another source of substances which promote the healing of wounds. In 1934 Loehr (58, 59) reported that the local application of cod-liver oil to first, second, and third degree burns remarkably aids recovery and healing. These findings were quickly confirmed and extended to include various types of lesions, suppurative or not, which tended to heal only with difficulty (Horn and Sander, 60, Strauss, 61, Steel, 62, and others). Since paraffin and other vitamin-free oils were found to be ineffective, it was immediately assumed that the vitamins were responsible for the beneficial effects. The subsequent investigations of Loehr and Unger (63), Loehr, Unger, and Zacher (64), Zacher and Spier (65), and Koch and Engels (66) seem to indicate that the major portion of the activity is to be attributed to the unsaturated fatty acids of these oils. Thus the essential unsaturated fatty acids, previously known as Vitamin F, were implicated in the process of wound healing. Vitamin A is considered to have a synergistic action with the fatty acids, an excess of Vitamin A, however, retards healing.

This subject has recently been taken up by investigators in America, who have come to somewhat different conclusions. Ralli and Brandaleone (67) have studied the effects of local application of cod-liver oil on the rate of healing of wounds experimentally produced in rats which had been

maintained on a diet deficient in Vitamin A. In the group of treated animals healing progressed twice as rapidly as in the untreated group. However, analysis revealed no difference in the Vitamin A contents of the livers of the two groups of animals. For this reason it was suggested that although cod-liver oil has a specific effect on the healing process, the active constituent is not Vitamin A. Puestow, Poncher, and Hammat (68) treated experimental burns in guinea pigs and rabbits with tannic acid and with ointments containing various oils having widely varying contents of Vitamins A and D. The vitamin-containing ointments increased the rate of healing by 25 per cent regardless of their content of vitamins. These authors concluded that neither Vitamin A nor Vitamin D could be responsible for the action of the cod-liver oil. Getz (69) has made a careful investigation of the effects of cod-liver oil on the rate of healing of tuberculous ulcers produced in guinea pigs by the intracutaneous injection of tubercle bacilli. The rate of healing was definitely more rapid in 86 animals treated with cod-liver oil than in 89 animals not so treated. This effect could be obtained when the oil was administered locally, subcutaneously, or intramuscularly, but not by the oral route. Paraffin, lanum, olive, and cottonseed oils were found to be inactive. A systemic effect with the cod-liver oil was observed, the treated animals showed less generalized tuberculosis than the controls. Halibut and tuna liver oils were slightly less potent than cod-liver oil in spite of their much higher concentration of vitamins. It was found that the saponifiable fraction of cod-liver oil, which contained the fatty acids, was irritating and suppressed the healing process. The non-saponifiable fraction, on the other hand, caused a much more rapid healing than the whole oil. This fraction also exhibited an enhanced systemic effect against the tuberculosis. From this highly active fraction the heavy sterols were precipitated and found to be inactive. The active principle contained in the remaining vitamin fraction, was shown not to be either Vitamin A or D. This work may yield important results in the treatment of not only badly infected or slowly healing wounds, but also of tuberculosis.

ANATOMICAL NOTES

The fasciæ and fascial spaces of the region of the head and neck are of considerable surgical importance with regard to the routes of spread of infection and the proper incisions for drainage. In view of serious discrepancies in the various

earlier descriptions of these structures, Grodinsky and Holyoke (70) have made a new investigation based upon data obtained by study of dissections of and injections into 75 adult cadavers, and serial sections of 1 adult cadaver and 5 fetuses. The

tween available and non available iron was made. They suggested that the constituent of the liver which made it effective in promoting hemoglobin regeneration under these conditions might be an organic compound. Sturgis and Farrar (38) who employed Whipple's method confirmed the fact that liver is more potent than its equivalent in terms of iron. They further demonstrated that whatever the organic constituent of liver might be it was not contained in casein. They commented on the fact that the animals were receiving additional copper when the liver was being fed but not when the iron was administered. In view of the fact that dogs apparently require copper and that with Whipple's technique they may very easily be deficient in this element it cannot be considered established that liver contains an organic principle active in the treatment of secondary anemia. Hirt, Elvehjem and Kohler (39) have shown that the activity of various liver preparations can be accounted for on the basis of their content of iron and copper when the preparations are assayed in rats maintained on a whole milk diet. They conclude that in the rat whatever active organic constituents may be present in liver must also be present in milk.

It seems to be generally agreed that copper deficiency in adults is so rare that treatment of secondary anemia rarely requires the inclusion of copper supplements. In infants however the possibility exists that copper may be of value. Elvehjem, Duckles and Mendenhall (40) are continuing their studies of this aspect of the problem.

In regard to the rôle of arsenic in the regeneration of hemoglobin Hove, Elvehjem and Hart

(41) have recently reported that arsenic slightly delays the appearance of anemia in rats which have been placed on a diet deficient in copper but that arsenic does not augment the effect of iron and copper in correcting this type of anemia. They conclude that if arsenic is necessary for nutrition and hemoglobin formation in the rat extremely minute traces are sufficient.

A number of diseases in cattle and sheep characterized by severe anemia have recently been shown to be due to a deficiency of cobalt. The administration of cobalt to experimental animals produces a polycythemia. Underwood (42) has detected traces of cobalt in a number of standard iron salts commonly used in the treatment of secondary anemias. In view of these facts he suggested the possibility that traces of cobalt might be required in man and that the reported superiority of massive doses of iron might be due to traces of cobalt. Kato (43) has reported that iron and cobalt produce prompt remissions in the nutritional anemia of infants. However Underwood and Elvehjem (44) could demonstrate no effect from the use of cobalt in controlling the anemia of rats maintained on a diet of whole milk. Since the milk contained significant traces of cobalt they could not definitely eliminate the possibility that cobalt is essential for hemoglobin regeneration. It remains for future investigation to determine the human requirements for cobalt.

Davis (45) has recently reported that liver extracts effective in the treatment of pernicious anemia but not desiccated hog stomach are able to correct the polycythemia produced in dogs by cobalt or by strenuous exercise.

WOUND HEALING

It is now well established that the introduction of maggots into a suppurating and poorly healing wound definitely assists in the process of healing. Part of this beneficial effect must be attributed to the fact that the maggots remove necrotic tissue and thus retard the growth and proliferation of pyogenic organisms. Robinson (46) considers that in addition to this action the maggots excrete into the wound some substance which specifically promotes healing of the tissues. By a rather ingenious process of reasoning he concluded that allantoin might be such an active substance. Investigation showed that allantoin is excreted by maggots and that it greatly promotes the healing of infected wounds. Although no claim was made that allantoin could be completely substituted for maggots the treatment was effective and its simplicity had much to recommend it. This

turned out to be a remedy previously discovered in 1912 by Matalster (47). The latter had reported that infusions of comfrey root, an old home remedy long used by the natives of rural England, promoted the healing of wounds. Analysis revealed that the infusion contained allantoin. Bethun (48) and Kaplan (49) confirmed Robinson's findings in regard to the advantages of the allantoin treatment of suppurative wounds. Continuing his search for active substance which might be excreted by maggots Robinson (50) subsequently reported that urea in a 2 per cent solution was also efficacious in the treatment of wounds. He attributed the effects to a cleansing action due to the removal of necrotic material and pyogenic bacteria and to a direct promotion of growth and granulation tissue. Symmers and Kirk (51) in 1915 and Foulger

and Foshay (52) in 1935 had previously reported that wound healing was promoted by urea solutions. Millar in 1933 (53) had shown that treatment with urea suppresses the foul odor of sloughing cancerous lesions. It is well known to biochemists that strong urea solutions are excellent solvents for protein material, both natural and denatured. Since Robinson's work appeared several reports have confirmed the value of urea solutions in the treatment of wounds (Holder and McKay, 54, Bogart, 55, Baker, 56, Muldavin and Holtzmann, 57). Most of the later workers agree that concentrated solutions or even crystals of urea are superior to the dilute solution employed by Robinson. The advantages of the method of treatment are its cheapness, simplicity, and its freedom from toxicity and irritation.

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report contains numerous drawings and references to the clinical significance of the findings

Anson Wilson and Gaardmoe (71) have recently described the form arrangement and relationships of the air cells of the petrous portion of the temporal bone of a four year-old child. Since the description was based on wax plate reconstructions made to scale from serial sections of the temporal bone it was possible to demonstrate not only the form of individual cells and of the mass of pneumatized tissues as a whole but the relations of the assemblage of cells to structures within the temporal bone

Schunke (72) has contributed a description of the embryological development and the adult structure of the sacro-iliac joint in man

Ronstrom (73) has investigated in detail the vascular supply of the kidney based upon dissection and study of corrosion preparations of 54 kidneys taken from subjects varying in age from two to seventy years. McMahon (74) has investigated the anatomy of the ejaculatory ducts and seminal vesicles in over 100 specimens by means of injection technique followed by clearing with a modified Spalteholz method

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Birge, H. L. Cancer of the Eyelids, Conjunctiva, and Cornea II Squamous-Cell Epithelioma *Arch. Ophth.*, 1938, 20 254

Squamous-cell epithelioma of the eyelids, conjunctiva, and cornea occurred in 25 per cent of the cases of epithelioma of the eye and its adnexa that were studied. The conjunctival surfaces, including the cornea, gave origin to 37 per cent of the squamous-cell epitheliomas. Primary corneal squamous-cell epitheliomas occurred in 5 per cent of the cases in this series. The malignancy of most of the lesions in the entire series was either of Grade 2 or Grade 3 on the basis of histopathological examination. Chronic irritation or trauma was an etiological factor in 32.2 per cent of the cases.

There was close correlation between the clinical behavior over a period of fifteen years, and the grade of malignancy. Lesions of Grade 1 did not cause death or loss of an affected eye. Lesions of Grade 2 caused loss of the affected eye in 25 per cent of the cases and death in 15 per cent. Lesions of Grade 3 caused loss of the affected eye in 53 per cent of the cases and death in 46 per cent. Lesions of Grade 4 caused loss of the affected eye in all the cases and death in 80 per cent.

The situation of the lesion about the eye or eyelids is of considerable importance, judged by the related percentage of mortality and blindness. Recurrences were frequent in this series. They equaled approximately the number of cases in which malignancy of the lesions was of Grades 3 and 4. The average mortality of all types of epithelioma of the eye and eyelids was about 12 per cent. The mortality and blindness were directly proportional to the histopathological grade of malignancy. Lesions of Grades 3 and 4 were responsible for the largest part of the mortality and blindness.

Given (1) early recognition of the grade of malignancy and (2) treatment proportional with the grade of malignancy, carcinomas about the eye should carry low mortality.

Kronenberg, B. The Topography and Frequency of Complications of Uveal Sarcoma *Arch. Ophth.*, 1938, 20 290

From 1928 to 1935, 995 eyeballs were examined at the New York Eye and Ear Infirmary. Sarcoma of the uvea was found in 126 (12.8 per cent). These sarcomas, together with 62 other uveal tumors available for study, are the basis of this report.

Sarcoma of the chorioid alone occurred in 164 cases (88 per cent), and with extensions to the ciliary body in 2 cases. The ciliary body alone was

involved in 4 cases, the ciliary body and iris in 9, and the iris alone in 9.

Of the 166 sarcomas of the chorioid, 51.7 per cent were located posteriorly, 19.8 per cent anteriorly, and 16.2 per cent equatorially. The largest number (24.7 per cent) occurred in the posterior temporal region, whereas only 4.8 per cent occurred in the posterior nasal region. The temporal zone showed 37.3 per cent while the nasal region was involved in only 13.8 per cent. It appears that most sarcomas of the chorioid occur in the posterior temporal region with consequent early involvement of vision and early diagnosis.

The ages of the patients ranged from fourteen to eighty-four years, averaging fifty-two and six-tenths years. There was no difference as to sex or involvement of either eye. Pigmentation was proved in 76.5 per cent of the sarcomas, but the others were not completely sectioned, and the proportion was probably higher. If sufficient sections are examined it will be found that practically all tumors are pigmented. The opinion expressed by Samuels that all tumors possess a prepigment substance which is converted into pigment by oxidation has gained wide acceptance.

The types of cells were either round, spindle, or mixed. The cells have a different appearance when sectioned at a different angle. Round cells were found in 47 cases, spindle cells in 54, and mixed cells in 41. The rest were not determined.

The determination of the shape is valuable for prognosis. An early tumor is apt to be flat because it is compressed by the lamina vitrea on one side and the sclera on the other. The tumor then grows in the perichorioid space without meeting much resistance until it reaches the attachment of the ciliary body anteriorly or the zone in which the chorioid is bound to the sclera posteriorly. At this stage it has the shape of a loaf of bread. With further growth it breaks through the lamina vitrea and develops a mushroom growth, later developing into a spherical mass.

Complications which may be encountered are retinal detachment, glaucoma, extra-ocular extension, and necrosis. Retinal detachment occurred in 127 cases, and in 13 of 14 cases in which the tumor was located in the circumpapillary region. Glaucoma is considered to mark the second stage of the growth, being caused by pressure of the subretinal fluid forward against the lens and iris. The site of the tumor did not seem to affect the development of glaucoma.

Extra-ocular extensions occurred along the perforating vessels, from where metastases also occur. Extensions along the vessels were found in 36 per cent, and not found in 61 per cent. In the remaining

cases the question was not determined. The location of the tumor did not influence the frequency of the extensions.

Necrosis occurs as the result of poor circulation. Some cases showed a severe iridocyclitis due to the toxins developed by the tumor.

Metastatic tumors of the choroid appeared principally in the posterior segments. In 4 of 10 cases they were in the circumpapillary region in another 4 cases they were in the posterior portion and in the 2 remaining cases they occupied the entire globe.

The average age of the patients with sarcoma of the iris was forty and three tenths years which was lower than that of the group with sarcoma of the choroid.

EDWARD S. PLATT, M.D.

EAR

Brain W. R. Vertigo Its Neurological Otolological and Surgical Aspects. *Brit. M. J.* 1938 2 605

Brain defines vertigo as the consciousness of disordered orientation of the body in space. For consciousness the orientation of the body in space is normally an orderly dynamic relation between the bodily schema and the schema of the external world. Vertigo is the state of consciousness which arises when this relation becomes disordered.

Vertigo may arise as a result of a disturbance of function at many different levels. Thus there can be recognized psychogenic vertigo, vertigo due to cortical disturbances, vertigo of ocular origin, vertigo of cerebellar origin, vertigo due to lesions of the brain stem and to lesions of the eighth nerve and aural vertigo.

Psychogenic vertigo is usually associated with severe feelings of anxiety and symptoms of over activity of the sympathetic nervous system. Vertigo may also occur as a conversion symptom in hysteria. An epileptic cortical discharge may cause a feeling of vertigo as is not uncommon in petit mal. It may arise as a symptom of migraine or of localized cortical lesions. Other than its association with diplopia, vertigo may occur as a result of a difficulty in adaptation of the posture of the body to an unusual visual environment such as a rapidly moving train seen from the railway platform.

Vertigo of cerebellar origin does arise although it is difficult to define the rôle of the cerebellum especially when the lesion involves the inferior vermis which is closely linked anatomically with the vestibular system. Vertigo is caused by vascular or neoplastic lesions of the brain stem but is most striking when disseminated sclerosis involves the pons. Vertigo due to a lesion of the eighth nerve especially acoustic neuroma closely simulates aural vertigo as it is associated with deafness and tinnitus. The author does not concern himself with vertigo as a symptom in pathological states of the ear but confines himself to discussing certain problems associated with Ménière's syndrome.

NOAR D. FABRICANT, M.D.

Hallpike C. S. and Cairns H. Observations on the Pathology of Ménière's Syndrome. *Proc. Roy. Soc. Med. Lond.* 1938 31 1317

The authors describe the pathological changes in the temporal bones in 2 cases of Ménière's syndrome. Death occurred in both patients shortly after operation for section of the eighth nerve. The surgical factors concerned in the operative failure of these cases are discussed only in so far as they are related to the interpretation of the histological changes.

JAMES C. BRASWELL, M.D.

NOSE AND SINUSES

Cappell D. F. The Pathology of Nasopharyngeal Tumors. *J. Laryngol. & Otol.* 1938 53 558

Cappell reviews the tumor material submitted at the Dundee Royal Infirmary (Scotland) in so far as it concerns the subject of the pathology of nasopharyngeal tumors. During the past eight years 122 new growths from the nasopharynx, tonsils and pharynx were studied. Sixty-four per cent of the tumors were classified as squamous epithelioma, 10 per cent as lympho-epithelioma and transitional celled carcinoma and 8 per cent were paraneurial mixed tumors. Among 4.5 per cent of miscellaneous neoplasms an example of malignant rhabdomyoma occurred.

Most of the conditions enumerated are too well known to merit special attention. Cappell concerns himself primarily with a discussion of rhabdomyoma and lympho-epithelial tumors. Rhabdomyoma of the soft palate occurs chiefly in childhood or adolescence. It at first appears as a simple tumor and produces symptoms by local effects, such as alteration of the voice, difficulty in speech or in swallowing or by causing a discharge following ulceration of the surface. When first seen such growths are likely to present a nodular polypoid structure of white or flesh color. The growth may be sessile or the whole may be suspended from the mucosa by a thin pedicle. Following simple removal local recurrence is likely and in spite of more radical operation subsequently which may cure the local condition dissemination by the lymphatics and later by the blood stream appears to be inevitable. The only hope of cure lies in more radical removal of the primary growth and the tissues whence it springs than has yet been attempted in the initial stages of the condition. From the histopathological point of view the characteristic elements of these tumors are the long tubular and strap-like cells with parallel sides and strongly acidophile cytoplasm in which both longitudinal and cross striation is usually demonstrable.

Lympho-epithelial tumors are encountered most frequently in the nasopharynx and tonsils and less often in the hypopharynx. The nasopharyngeal growths give rise to slowly growing tumors of moderately firm consistency in the lateral wall. The most common site is close to the mouth of the Eustachian tube so that unilateral deafness is often

present and may be the first symptom. The primary growth is usually small. For a time the tumor grows expansively and pushes aside neighboring structures, but later, infiltration of the surrounding tissues becomes pronounced. In the late stages the primary growth may attain a large size and give rise to nasal obstruction and difficulty in swallowing and speaking. There is a great tendency toward invasion of the skull base, so that nerve palsies are common. Lympho-epithelial tumors occur at all ages from childhood to old age.

In Cappell's series, the extreme radiosensitivity of these tumors was apparent. Twenty-one patients were observed, 4 of whom had survived for a period of more than five years following radiation therapy, 3 having been treated with radium and 1 with deep x-rays. One other recent case is still under observation. Good local response to radiation was obtained in 6 additional patients, but death took place from intercurrent disease or from metastases, as the site of the local lesion had remained free from recurrence. Emphasis is laid on the absence of harmful results following open biopsy, but further surgical measures are unnecessary and treatment by radiation is the method of choice. NOAH D. FABRICANT, M.D.

MOUTH

Shore, B. R. Sublingual Epidermoid Cysts. *Ann Surg*, 1938, 108: 305.

The author reports 4 cases of true epidermoid cyst arising in the floor of the mouth. Each of the cysts was lined with stratified squamous epithelium, 2 contained hairs or hair follicles. Pre-operative and post-operative illustrations of 1 of these cases are presented with a photograph and a photomicrograph of the specimen. The author discusses the origin of these cysts from fetal remnants in the mesobranchial field and differentiates them from ranulae. He advocates surgical excision as the treatment of choice. BRADFORD CANNON, M.D.

PHARYNX

Frank, I. Papilloma of the Tonsil, with a Report of 3 Cases. *Ann Otol, Rhinol & Laryngol*, 1938, 47: 715.

The author reports 3 cases of hard papilloma of the tonsil, verified by histological examination.

The literature is reviewed and the clinical aspects, and especially the causes of this condition, are discussed. JAMES C. BRASWELL, M.D.

NECK

Pons-Tortella, E., and Broggi-Vallès, M. An Anatomical Study of the Cellular Spaces of the Neck (Étude anatomique des espaces cellulaires du cou). *Lyon chir*, 1938, 35: 513.

The authors have attempted in this study to clear up any misunderstanding as to the extent and character of the cellular spaces of the neck. They used

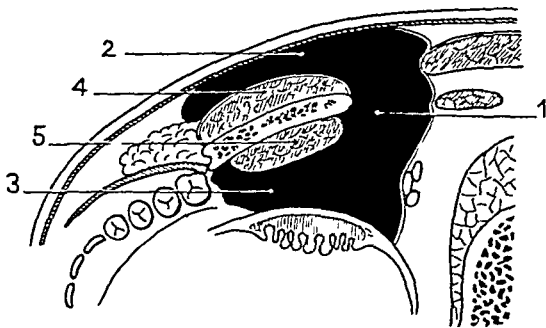


Fig 1 Schematic drawing of the submaxillary angle space and its prolongations

materials which solidify after injection and which are opaque to the x-rays. The injections were followed by a study of the roentgenograms and then by anatomical dissection.

The material consisted of 23 cases, both adult and child cadavers, which were without preservation. The cellular spaces were studied with particular reference to their practical importance. In practically all cases, 60 c.c. of an aqueous suspension of barium sulfate in variable concentrations and tinted vermilion were used. Sometimes plaster-of-Paris was added. Immediately following the injections two roentgenograms were made, one of the sagittal section (Fig 1) and the other of the transverse view (Fig 2).

The cellular spaces of the neck were classified as follows, there being 6 main divisions and 14 subdivisions.

Outline of the Cellular Spaces of the Neck

- 1 Intermaxillary-parotid space and its prolongations

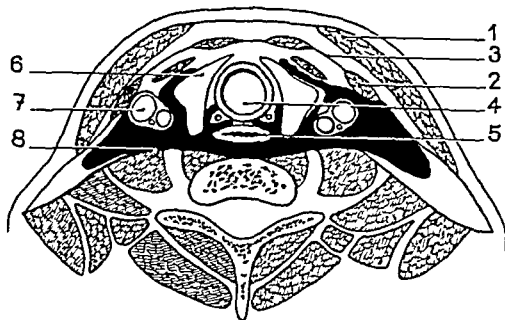


Fig 2 Schematic drawing showing the arrangement of the deep space of the neck

- 1 Sternocleidomastoid
- 2 Omohyoid
- 3 Middle aponeurosis
- 4 Trachea
- 5 Esophagus
- 6 Thyroid
- 7 Neurovascular bundle
- 8 Prevertebral aponeurosis

- a External superficial suprahyoid
- b Middle space properly speaking the intermaxillary parotid
- c Internal
- 2 Submaxillary-sublingual space
 - a Submaxillary
 - b Sublingual
- 3 Deep symmetrical space of the neck (vasculo visceroprevertebral)
 - a Cellular space surrounding the neurovascular bundle
 - b Perivisceral
 - c Supraclavicular
 - d Anterior mediastinal prolongation
 - e Posterior mediastinal prolongation
- 4 Submuscular space
 - a Constant prolongation toward the supraclavicular region
 - b Indirect prolongation toward the supraclavicular region
 - c Inconstant prolongation toward the middle infrahyoid region
 - d Superior prolongation toward the nape of the neck
- 5 Infrahyoid space
- 6 Suprasternal space

RICHARD J BENNETT JR MD

Cohn L C Complete Excision of the Cervical Glands for Regional Metastases *Arch Surg* 1938 37 240

This study is confined to cases of operable carcinoma in which there was secondary involvement of the cervical glands by metastasis from a primary lesion located in the region of these glands. There were 31 cases operated on between the years 1925 and 1937.

A restricted operation on the cervical glands is often adequate for carcinoma of the lower lip but not in cases of advanced carcinoma of the tongue floor of the mouth mucous membrane of the lower jaw or the jaw itself as the regional lymphatic glands may also be involved (Fig 1).

The operative mortality in this series of 31 patients was approximately 10 per cent. The author believes that this mortality is far too high and is of the opinion that it can be materially reduced. Twenty one of the 31 operations were performed with local anesthesia and in these 21 cases the operative mortality was nil.

There seems to be no danger in delaying the operation for a course of pre operative irradiation when the gland are not palpable or for the purpose of testing the sensitivity of the tumor to rays when they are palpable.

The patients subjected to this radical operation were patients in whom there was definite metastasis or presumptive evidence of metastasis confirmed by a study of a frozen section at the beginning of the complete excision.

In those patients in whom complete excision of the glands of the neck for unilateral malignant disease was indicated the operation consisted of excision of the submental lymphatic glands unilateral excision of the submaxillary lymphatic and salivary glands and of the occipital the deep cervical the paratracheal the prelaryngeal the superior anterior cervical and the infrahyoid lymphatic gland and resection of the sternocleidomastoid and the omohyoid muscles and of the internal jugular vein. A very thorough and technical description of the structures encountered the normal and pathological tissues removed and the technique involved are recorded here in detail.

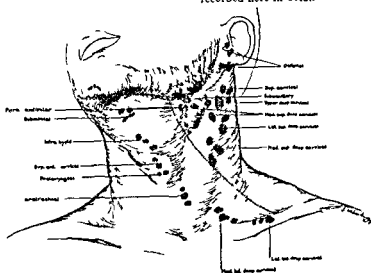


Fig 1

Thirty-eight per cent of the patients are living and 62 per cent are dead following this radical procedure. At the time this paper was written, the shortest time a patient was living and well following operation was two and a half months.

The author is of the opinion that had these patients not been subjected to complete excision of these glands with or without irradiation they would not be living and free from recurrence. In regional metastasis in the cervical glands from carcinoma in which the condition is operable, the patient has a chance of good results in 38 per cent of the cases.

RICHARD J. BENNETT, JR., M.D.

Wegelin, C. The Hypophysis in Basedow's Disease (L'hypophyse dans la maladie de Basedow) *Ann d'anal path.*, 1938, 15 703

In 20 cases of exophthalmic goiter the hypophysis was examined at autopsy. The morphological lesions of the hypophysis were studied in order to determine whether or not the histological aspects pointed toward a hyperactivity of the anterior lobe in Basedow's disease. There were 11 cases of primary exophthalmic goiter in which no goiter had appeared previously. In the 9 other cases Basedow's disease had developed on the basis of a pre-existing goiter. The author emphasizes the fact that the results of his research do not exclude the possibility that thyrotropic hormone may have some significance in the development of Basedow's disease.

The weight of the hypophysis in Basedow's disease was found to be exceedingly variable. With the exclusion of 2 cases in which adenomas were found, the average weight of the hypophysis in the author's cases was found to be 0.674 gm.

Histological study of the hypophysis in 20 cases of Basedow's disease did not reveal any sign of hyperfunction of the hypophysis. On the contrary, in the anterior lobe there were degenerative lesions of the basophilic cells, as well as of the eosinophilic and the chromophobe cells. There was a certain diminution in the size of the cells, especially in the eosinophilic cells, which was characterized by a cellular dissociation and pericapillary edema and accompanied by a decided hyperemia. It was believed that these lesions were produced by the increase of thyroxin in the blood in Basedow's disease.

In the posterior lobe, the cellular, colloid, and pigmentary "neurocrinie" were generally limited or completely lacking.

The morphological findings in this study do not permit the assumption that a hypophyseal hyperfunction is responsible for Basedow's disease. This finding reaffirms the results of clinical research of

other authors who have shown that there is a diminution of the thyrotropic hormone in the blood of individuals with Basedow's disease.

RICHARD J. BENNETT, JR., M.D.

Harris, W., and Klemperer, P. Pathological Differentiation Between Radiosensitive and Non-Radiosensitive Malignant Neoplasms of the Larynx. *Arch Otolaryngol.*, 1938, 28 355

Harris and Klemperer studied 32 cases of laryngeal carcinoma in which the only treatment was roentgen irradiation according to the principles of Coutard. In the same period they observed 2 sarcomas of the larynx and 1 cylindroma, which also were treated by roentgen rays. All of the lesions occurred on the epiglottis or within the larynx. Twenty of the 32 patients responded favorably to the roentgen therapy, 12 failed to respond.

Biopsy material was studied histologically for criteria for pathological differentiation of radiosensitive and radioresistant neoplasms. In a considerable number of instances the authors found that the histological picture of the biopsy specimen did not fully conform to that of the entire tumor as regards the degree of differentiation and other cytological features. The grade of cellular differentiations, mitotic count, anaplasia of the cells, reaction in the stroma, and the location of the neoplasms were carefully considered.

Observations made by the authors tend to show that there are no pathological criteria, except possibly the number of mitoses, which permit of a differentiation between radiosensitive and radioresistant laryngeal carcinoma if protracted fractional roentgen therapy is employed. This conclusion seems to contradict the accepted belief that radiosensitivity depends largely on the degree of differentiation of the tumor cells.

NOAH D. FABRICANT, M.D.

Orton, H. B. Cancer of the Larynx. The Immediate and Ultimate Results of Operation in 102 Cases. *Arch Otolaryngol.*, 1938, 28 153

Orton states that early recognition and diagnosis of cancer of the larynx makes possible cure by surgical measures such as laryngofissure, laryngectomy, or lateral transthyroid pharyngotomy.

Since there is recurrence in 50 per cent of the cases of subglottic cancer, total laryngectomy is preferable to laryngofissure in its treatment.

The author is of the opinion that laryngectomy is not a mutilating operation and that laryngectomized patients are not despondent, they are a happy lot, getting a great deal out of life.

JAMES C. BRASWELL, M.D.

- a External superficial suprahyoid
- b Middle space properly speaking the inter maxillary parotid
- c Internal
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 - a Submaxillary
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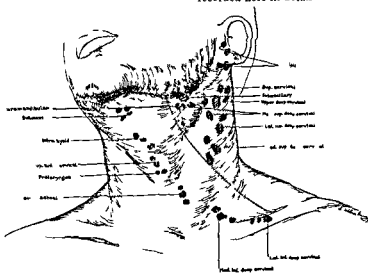


Fig. 1

border, particularly in the region of the longitudinal sinus. Upon removal of the sac the brain is flattened and separated one inch or more from the dura. The hemisphere does not expand rapidly to its normal contour ordinarily, and if it does so immediately, a similar lesion is to be suspected on the opposite side.

In the majority of cases a history of a trivial blow on the head can be obtained, usually followed by a brief period with symptoms of concussion. Several days or weeks may elapse before the lesion causes any other symptoms. The first symptom is usually headache, which is persistent, variable, often throbbing, and increases in intensity. Nausea and vomiting may occur. Mental and personality changes occur, and dullness deepens to stupor or coma. Remissions and exacerbations are frequent and striking, the patient passing alternately between coma and consciousness, and possibly acting quite normally when conscious. The neurological picture is one of generalized increased pressure, with rarely any definite focal symptoms. In general it conforms to that produced by a slowly expanding lesion over a large part of one or both hemispheres without local cortical irritation. The slow compression occasionally produces a gradually increasing paresis of the face, arm, and leg, but rarely is there a paralysis. Jacksonian attacks are almost never seen, but convulsive seizures may occur as a late symptom. The pulse is usually slow. The spinal fluid is often under increased pressure, and may be clear or xanthochromic. In the early stages the eye grounds are normal, but later they show venous congestion and gradual obscuration of the margins and total absence of the cups.

The increase in the size of the sac may be due to recurrent bleeding from the originally injured vein or from granulation tissue in the wall of the dura. McKenzie suggested also a process of osmosis, with the sac acting as a permeable membrane.

If a subdural clot is suspected burr openings should be made over both hemispheres. Air injection is seldom necessary, but may be necessary for a differential diagnosis. The simplicity of bilateral perforations allows the evacuation of a bilateral hematoma at one sitting without shock or hemorrhage. When a well organized clot is present a flap operation may be needed for its removal. Drainage is not necessary unless there is fresh bleeding.

Cerebral edema, supposed to be the most important postoperative complication, was not suspected or proved in any of the 14 cases presented. Postoperative extradural hemorrhage is more likely to occur than cerebral edema, especially when there is no increased pressure, and when a dead space persists after the evacuation of the clot. This occurred in 1 case of the series. The most important condition is failure of the compressed brain to expand promptly, and it has been noted frequently. The duration of the lesion is probably a determining factor in the postoperative expansion of the brain.

Of the 14 cases presented, a history of trauma was obtained in 12. There was 1 case with bilateral

clots. Two deaths occurred, one after a flap operation, the other following a subtemporal decompression. Choked discs were noted in 5 cases, while in the other 9 the pressure was increased, and in 4 it was xanthochromic. Headache was present in all cases. Mental disturbance was prominent in 10 cases. Vomiting occurred in only 4, coma in 2, and paresis of the cranial nerves and extremities was infrequent.

A flap operation was used in 7 cases, burr openings in 4, and subtemporal openings in 3 cases. The diagnosis in 10 cases was suspected from the history and verified by burr openings. Air injection led to the diagnosis and localization in 4 cases in which other lesions were suspected. Shifting of the pineal gland was seen in 1 case. EDWARD S. PLATT, M.D.

Davidoff, L. M., and Dyke, C. G. Relapsing Juvenile Chronic Subdural Hematoma. *Bull. Neurol. Inst. New York*, 1938, 7, 95.

Trauma to the head at birth and in infancy is of common occurrence. The diagnosis of subdural hematoma in infancy is easily confirmed by puncture of the subdural space through the anterior fontanel. In spite of this knowledge, the condition often remains undiagnosed. Some of these undiagnosed hematomas may go on to spontaneous recovery, others may calcify, and still others may persist, in spite of the disappearance of symptoms, because they mold the adjacent malleable skull of the child to accommodate their mass. In the last type of case, if a



Fig 1. Left subdural hematoma. Postero-anterior view showing obliteration of oblique line demarcating postero-lateral wall of bone orbit, indistinctness of the lateral and inferior wall of the left superior orbital fissure (white arrows) and elevation of left sphenoid ridge (black arrow).

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Young F G Experimental Investigations on the Relationship of the Anterior Hypophysis to Diabetes Mellitus *Proc Roy Soc Med Lond* 1938 31 1305

A few years ago our theories on the causation of diabetes mellitus seemed quite complete. Within the past six or seven years however experimental work on the anterior lobe of the pituitary gland has revealed facts which are very disturbing to the older theories. In 1931 Housay showed that the administration of substance from the anterior lobe of the pituitary from hypophysectomized and depancreatized animals resulted in a very marked increase in the severity of diabetic symptoms. The author confirms this work and discusses at considerable length the possible nature of this diabetogenic material and the possible modes of its action.

Dogs were used in the author's series of experiments because they give more consistent results. The pancreas and pituitary gland had not been removed from them as in the animals used in Housay's experiments. In from three to four days following the daily intraperitoneal injection of a suitable amount of crude saline extracts of fresh anterior pituitary gland the urine increased in quantity and glycosuria and ketonuria supervened. When the same quantity of extract was continued the animals lost their diabetic characteristics but when the quantity was increased the diabetic qualities again became manifest. When this process was continued sufficiently long the majority of the dogs became permanently diabetic with the exception that they were able to maintain body weight and did not require the use of insulin.

In his evaluation of this work the author discusses the influence of the anterior lobe of the pituitary gland on the action of insulin on the islet tissues of the pancreas on the glycogen stores during a fast and the influence of pituitary extracts on ketogenesis. It has been shown that the daily administration of extracts from the anterior lobe of the pituitary gland will markedly lower the hypoglycemic action in rabbits and that this action is due to a substance which is present in preparations of the so-called lactogenic hormone (prolactin). The author refers to this as glycotropic substance. The injection of this glycotropic substance definitely decreases the tendency of insulin to increase the liver glycogen level and inhibits the action of insulin in the peripheral tissues.

It has been shown that the injection of such diabetogenic extracts will result in a true hypertrophy of the islet cells of the pancreas in several types of animals. The fraction that causes this action has not yet been isolated.

With regard to the action on the glycogen stores during a fast it was found that the administration of glycotropic substance resulted in a definite increase in the liver glycogen content. The reason for this is not at all clear and it is suggested that there may be less utilization of carbohydrates or that there might be some glycogenesis from fat.

The administration of substance from the anterior lobe will result in an increase in ketone excretion though as yet little is known of the nature of the active principle which causes such an increase.

In his discussion of the nature of the diabetogenic factor of the anterior lobe of the pituitary gland the author points out that at least three factors are necessary for the production of diabetes in the normal dog. The exact nature of these factors is not known at the present time. In referring to the mechanism of the diabetogenic action of the anterior lobe extracts the author states inherent processes of manufacture of sugar in the liver and utilization in the peripheral tissues probably exist these processes being intrinsic properties of the relevant tissues the precise mutual adjustment of the rates of these two processes is mediated by the endocrine system the antagonistic actions of insulin and the pituitary factors playing an important rôle in the adjustment. If this is so then freedom from diabetes is the result of a precise regulation of the relative potencies of the pancreatic and pituitary factors. If for any reason the regulation is faulty so that pituitary effects predominate then diabetes may result.

JORV WILTSIE EPTON M D

Coblentz R G Chronic Subdural Hematoma *Surgery* 1938 4 194

Chronic subdural hematoma was first accurately described by Virchow in 1857 under the name of hematoma durae matris or pachymeningitis hemorrhagica interna. He thought the condition was spontaneous in origin because of a progressive inflammatory condition and described a vascular subdural membrane with ecchymous and subdural hemorrhage. He recognized a traumatic type chiefly in the newborn. Until 1914 little attention was paid to the condition except to the pathology and Trotter then stated that the veins passing from the brain to the tributaries of the superior longitudinal sinus are the source of the blood.

Spiller and McCarthy (1909) found experimentally that the new membrane was present in a few days and distinctly formed in five weeks. The lesion is an encysted clot under the dura. At operation it has a characteristic dark greenish blue appearance or in the late stages it is greenish yellow. When the sac is opened a dark reddish brown liquid escapes and clots in various stages of liquefaction may be seen. The inner wall of the sac lies directly over the arachnoid and is not adherent to it except at its

- a Normal sized ventricles
- b Slight or moderate displacement of the ventricles to the side opposite the lesion (Fig 2)
- c Relatively slight asymmetry of the lateral ventricles
- d Relatively slight difference of the roofs of the lateral ventricles

The skull changes are probably due primarily to increased intracranial pressure by the original hematoma, and secondarily to decreased intracranial pressure subsequent to resorption of the fluid from the sac of the hematoma, which results in hypertrophy of the accessory nasal sinuses and thickening of the cranial vault

DAVID J. IMPASTATO, M D

Kaplan, A Subdural Hematoma, Acute and Chronic, with Some Remarks About Treatment *Surgery*, 1938, 4, 211

Of the entire group of head injuries, those presenting subdural hematomas most frequently require a critical decision as to whether or not surgical intervention is necessary. The almost uniformly excellent results following operation of chronic subdural hematomas as done in neurosurgical clinics may result in operative procedures being carried out in other cases of head injury with coma in which operation can end only disastrously. The small margin of safety may be adequate if medical treatment is followed, but may not allow the manipulation necessary for radiography and operation

SUBACUTE DURAL HEMATOMA

Subdural hematomas must be differentiated into acute and chronic phases. Acute subdural hematoma does not exist by itself for there is invariably an associated laceration of the brain as well as a fracture of the skull. There is both arterial and venous bleeding, the blood spreading through the subdural space and the adjoining subarachnoid meshes, with often a fine layer of blood dissecting beneath the pia mater.

Because of the suspended position of the brain in the skull it lags behind at the time of the blow, and it continues to travel forward when the skull stops, thereby striking against the jagged prominences of the base of the skull with resulting laceration of the brain and vascular rupture. Therefore, the most frequent sites of damage are the tips of the temporal and frontal lobes.

Patients with acute traumatic subdural hematomas present symptoms varying with the degree of brain laceration and the associated intracranial bleeding. A single small laceration is accompanied by moderate bleeding into the subdural space, and usually causes immediate unconsciousness followed by signs of recovery in several hours. The best guide to the degree of cerebral trauma is the varying state of the patient's consciousness. Signs of returning consciousness within several hours point to a favorable outcome, and are far more reliable than the pulse or blood pressure readings. Increasing

stupor and coma after twenty-four hours usually mean extensive brain laceration, cerebral edema, and massive bleeding, and indicate an unfavorable outlook.

Most cases of acute intracranial injuries are treated best by absolute rest, moderate dehydration, measures combating shock, and judicious lumbar puncture. Compound and depressed fractures and extradural bleeding are conditions which may require surgical intervention. Patients with mild lacerations and small quantities of blood in the subdural space will respond best to the medical treatment alone. Those with extensive brain lacerations and massive subdural hemorrhage are rarely helped by operation, but there are rare cases which may be helped by removal of the blood clot. Of several hundred cases of acute subdural hematoma seen by the author at Bellevue Hospital, New York, there were only 4 which seemed to offer hope of improvement from operation. In only 1 of these was decided improvement noted following operation, and in this case the patient was left with a paresis of the left arm and left homonymous hemianopsia after a surprising recovery. In this case the increase of symptoms after an interval of improvement, and the focal nature of the convulsions were the indications for operation.

CHRONIC SUBDURAL HEMATOMA

This condition occurs more frequently than middle meningeal hemorrhage. It is the result of a relatively mild trauma to the head which displaces the brain in an anteroposterior direction with resulting tear of one or more of the cerebral veins as they enter the superior longitudinal sinus. Slow *intermittent* and variable bleeding follows the injury, and within from ten to fourteen days a fine membrane, arising mainly from the inner lining of the dura, encloses the blood and gradually forms a cyst wall.

Variations in the tension within the cyst account for the fluctuations in consciousness and explain the variations in the pupil, the paresis, the facial weakness, and the Babinski sign. The presence of hemiparesis, dilated pupil, facial weakness, and the hematoma all on the same side is so constant as to be of diagnostic significance. The dilated pupil is a more constant localizing sign than the paresis. The variations in symptoms are so marked as to be characteristic of chronic subdural hematoma. In a middle-aged or elderly patient the condition is often thought to be a cerebral neoplasm, post-traumatic neurosis, encephalitis, cerebral arteriosclerosis, cerebral thrombosis, or psychoneurosis. The spinal fluid is usually under increased pressure and often xanthochromatic. Bilateral trepanation is often the only way to establish the diagnosis. This procedure is done over the postparietal region, and if a hematoma is not found, ventriculography can be done through the same openings. A well organized hematoma can be removed thoroughly only by a craniotomy.

In 1 patient in whom mental signs developed one week after operation, accompanied by fever, stiff



Fig 2 Same case as Fig 1. The lateral and third ventricles are displaced to the right. The roof of the right is 1 mm higher than the left. The left superior orbital plate and ridge and left side of the cribriform plate are elevated (arrows).

trauma to the head occurs later in life, bleeding in the sac of the old hematoma may again occur with recurrence of the symptoms. Further, these cases show advanced bone changes in the skull adjacent to the lesion as a result of the old and original hematoma. The authors present 4 such cases which



Fig 3 Lateral view showing the downward and forward expansion of the right middle fossa (white arrows). Black arrows demarcate inferior and anterior margins of the left middle fossa. Letter A indicates posteriorly displaced pineal gland.

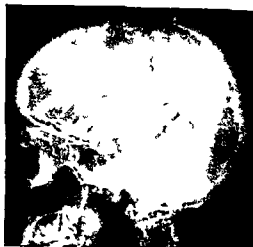


Fig 4 Same case as Fig 3. Lateral horizontal cephalogram showing the normal size and shape of the lateral ventricles. The right sphenoid ridge (arrows) is elevated.

they believe constitute a new clinical entity and which are characterized by the following findings:

1. The individual is young. The ages of the authors' 4 patients were six, fourteen, sixteen, and eighteen years.

2. There is a history of an early trauma which occurred over a period of from five to eleven years before admission of the patients to the hospital.

3. There is a history of a more recent cranial trauma. This occurred two months, five months, six months, and twelve months prior to admission.

4. There is evidence of a moderate increase of intracranial pressure and minimal localizing neurological signs.

5. There is in some cases visible deformity of the skull in some patients. There was a generalized enlargement of the head in one case and a localized protrusion of the right frontotemporal region associated with ipsilateral exophthalmos in another.

6. The plain roentgenograms show changes in the skull on the side of the lesion, which consisted of the following in the authors' cases:

a. Elevation of the sphenoid ridge (Figs 1 and 4), superior orbital plate, and superior orbital ridge (Fig 2).

b. Deepening, widening, and lengthening of the middle fossa (Fig 3).

c. Disappearance and indistinctness of the oblique line delineating the posterolateral wall of the bony orbit (Fig 1).

d. Atrophy of the inferior and lateral wall of the superior orbital fissure.

e. Hypertrophy of the frontal and ethmoidal sinuses.

f. Thickening of the skull.

In the pneumoencephalograms the following was seen:

cranial nerves, plastic operations, or removal of the superior cervical sympathetic ganglion. Anastomosis of the peripheral end of the facial nerve with another cranial nerve may result in the restoration of facial symmetry and ability to close the eye, but there is never a return of involuntary or subconscious emotional movements. Also, the presence of associated movements, such as lifting movements of the shoulders in the spinofacial anastomosis, or rippling movements of the face with each act of mastication, swallowing, or speaking in hypoglossal facial anastomosis are very disturbing. The results of muscle implantation, of neurotization operations, or severance of the cervical sympathetic chain are as discouraging as those of the anastomosis operations.

Ballance and Duel have presented experimental and clinical evidence to show that the best results may be obtained by repair of the damaged facial nerve itself. They have removed the damaged portion of the nerve and replaced it by another nerve taken from some other part of the body. The graft was not sutured, but merely placed between the ends of the divided nerve in the canal.

Bauer describes a case of facial paralysis in a girl of seventeen, which was repaired by the method of Ballance and Duel. The paralysis followed an operation for acute mastoiditis. At reoperation, the facial nerve was seen to be badly damaged at one point within the canal. It was necessary to resect 25 mm. of this nerve and fill in the defect by a graft taken from the lateral femoral cutaneous nerve. Because the nerve was very thin, the graft was laid double and placed between the cut ends of the facial nerve without sutures. The graft was then covered with dentist's gold foil and dressed daily by the technique recommended by Ballance and Duel. The postoperative course was uneventful and the graft was entirely covered by granulation tissue within three weeks. The immediate postoperative treatment consisted of massage, electrical stimulation, and suspension of the angle of the mouth by a hook placed in the corner of the mouth and fastened to the dressing above the ear. Twitching movements were felt in the face two months after the operation, and within one year the patient was able to close her eye and elevate the angle of her mouth about 3 cm. There were no associated movements and the emotional responses were quite symmetrical, although the unaffected side of the mouth would lift higher than the affected side on smiling or laughing.

While the results obtained were not ideal, they were quite satisfactory. DAVID CLEVELAND, M.D.

SPINAL CORD AND ITS COVERINGS

Pool, J. L. Myeloscopes. Diagnostic Inspection of the Cauda Equina by Means of an Endoscope (Myeloscope). *Bull. Neurol. Inst. New York*, 1938, 7: 178.

The myeloscope is a small endoscope by which the contents of the spinal canal may be visualized. Pool has performed 40 myeloscopies, all limited to the

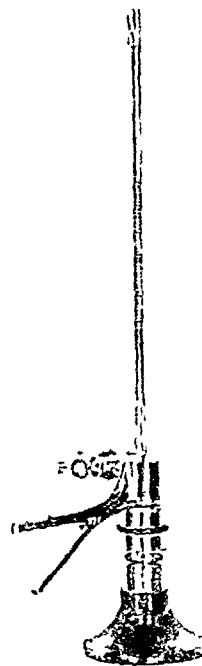


Fig. 1. Myeloscope assembled for visualization. Note offset light bulb and socket (top of figure), millimeter graduation on barrel of cannula (middle of figure), right angle stop-cock, and eyepiece (bottom of figure). The fork-like device (lower left) is a hinged handle facilitating withdrawal of parts of the instrument from the lumen of the cannula. (Magnification approximately one and one-half times natural size.)

lumbar portion of the spinal canal. As far as can be determined, these cases represent the first living subjects in whom the spinal canal has been examined by a myeloscope. The instrument consists of a small cannula which may be introduced into the subarachnoid space in the same manner as a lumbar puncture needle. The cannula receives a miniature lens and illuminating system, which permit inspection of the nerve roots, arachnoid membrane, and blood vessels of the cauda equina. The procedure causes no more inconvenience to the patient than an ordinary lumbar puncture and so far has not been followed by any deleterious effects.

A detailed description of the myeloscope (Fig. 1) and its use are given. The following report is one of five given by the author to illustrate the value of myeloscopes.

A boy fourteen years of age was admitted to the hospital with a history of rapidly progressive weakness of the lower extremities, which began one year prior to his admission, and was followed shortly afterward by loss of sphincter control. At the time of admission he was unable to walk without support. At no period of his illness did he suffer pain or sub-

neck and weakness of the left arm meningitis or an overlooked hematoma on the right side was suspected. Improvement followed repeated drainage of blood tinged spinal fluid which fact suggested that cerebral edema and the irritative effects of blood in the subarachnoid space might have been causing the symptoms.

In 1 patient with a positive Wassermann reaction rapid and marked fluctuations were observed and operation was delayed. The pupils were not carefully recorded probably because of only slight variations due to syphilis. In another patient the course of the hematoma was observed in the hospital. Following the onset of headache and somnolence diplopia external rectus weakness and nystagmus appeared accompanied by increased pressure of the spinal fluid.

The Ayala index is a valuable indicator of an expanding lesion. It is computed by dividing the final pressure by the initial pressure and multiplying the result by the number of cubic centimeters of fluid removed. Ten or more cubic centimeters of fluid must be removed. An Ayala index below 5 favors the diagnosis of an expanding intracranial lesion. If above 5 it indicates a non expanding lesion. In 1 patient with a coexisting hypertension the index showed the probability of an expanding lesion and operation revealed the presence of a hematoma the two conditions probably being independent of each other.

The histories and findings in 4 cases of acute and 15 cases of chronic subdural hematomas which came to operation are given in detail.

EDWARD S. PLATT, M.D.

Vincent G. Hartmann, E. and Delaitre, R. Recurring Meningeal Hemorrhages in Arterial Angiomas of the Brain (Les hémorragies récurrentes récidivant dans les angiomes artériels du cerveau). *Bull et mém Soc méd d hôp de Par* 1938 54 995.

The authors state that the two most common causes of meningeal hemorrhage are syphilis and arterial hypertension. Recurring meningeal hemorrhages in relatively young individuals however are often due to the presence of an arterial angioma of the brain. Most of the authors agree that this condition is characterized primarily by severe headaches, jacksonian attacks, hemiplegia and the presence of a xanthochromic cerebrospinal fluid.

The authors observed 2 cases the first that of a young man eighteen years old who since the age of ten had suffered from recurrent seizures which were originally diagnosed as epileptic attacks. Examination of the cerebrospinal fluid however revealed the presence of meningeal hemorrhage. The attacks recurred at regular intervals and were ushered in by severe headaches, vomiting and loss of consciousness. During the periods of remission the patient was completely asymptomatic.

When seen at the clinic the patient was in delirium and presented a marked cervical rigidity with a

slight opisthotonos and a positive Kernig's sign. The cerebro spinal fluid showed the presence of blood but no leucocytosis. The Wassermann reaction was negative. Following lumbar puncture the patient's condition improved.

The angiogram revealed the presence of an angioma about the size of a small apricot projecting from below the posterior branch of the sylvian artery. The long axis of the tumor was found to run parallel to the sylvian fissure.

The second case was that of a thirty year old sailor who experienced the first attack at the age of eight years. Since that time he had experienced several morbid episodes characterized by occipital headaches followed by a left hemiplegia and recurring at about yearly intervals. The angiogram of the brain showed the presence of an arteriovenous hemangioma about 5 by 3 1/2 cm in size located above the sylvian fissure in the parietal region.

The authors state that the presence of a cerebral hemangioma should always be suspected in young non hypertensive and non luetic individual with a history of recurrent attacks characterized by headaches, jacksonian seizures and cerebral hemorrhage. According to Cushing and Bailey the pathognomonic signs of cerebral hemangioma are (1) pulsating exophthalmos (2) angioma of the facial and cervical blood vessels and (3) vascular souffle. These signs were absent in the 2 patients studied by the authors. The second patient however presented a papilledema suggestive of an increased intracranial pressure.

The authors summarize this condition by stating that cerebral hemorrhage due to cerebral hemangiomas occur in young individual under twenty years of age. The hemorrhages usually occur at monthly or yearly intervals and are often accompanied by a hemiplegia or by jacksonian crises. A large percentage of the patients present signs of angiomatosis in the face or retinal vessels. These findings are not necessarily accompanied by papilledema. Sometimes these individuals present nevi in other parts of the body and in other cases one of the blood relatives may present a cutaneous angiomatosis.

The final diagnosis is made with the aid of a cerebral angiogram which is performed without danger to the patient if certain precautions are taken. The vascular tumor is usually found to be attached to one of the branches of the internal carotid artery.

RICHARD E. SODMA, M.D.

Bauer, C. Nerve Graft in Facial Palsy. *Arch Chirug Scand* 1938 81 130.

According to Bauer the occurrence of facial palsy following operation for mastoid disease cannot be considered uncommon. The paralysis is seldom recognized until the operation has been completed and the operator seldom realizes the extent of the paralysis until the facial canal is opened at a later operation. Surgical correction of facial paralysis has usually depended upon an anastomosis of the facial nerve with the ninth, eleventh or twelfth

Comment Accurate pre-operative diagnosis had been made by myelography when other means had failed
DAVID J. IMPASTATO, M.D.

MISCELLANEOUS

Derom, E An Experimental Control Study of Vasomotor Surgery of the Extremities (Contrôle expérimental de la chirurgie vasomotrice des membres) *Bruxelles-med*, 1938, 18 1390

Apparently skeptical of the widespread clinical reports of favorable results of surgery of the sympathetic nerves in vasomotor disease of the extremities, this author reports the effects of these various operations on the reflex vasomotor changes of carotid sinus origin in dogs. On the basis of his experiments he has concluded that carefully performed periaxillary sympathectomy has no effect on reflex vasomotor phenomena of such origin. He decries mutilating operations on the peripheral nerves, such as alcohol injections, fascicular dissociation, and crushing between forceps, and believes they have little place in the treatment of any disease, since they are primarily destructive and the beneficial results are at best short-lived. Several forms of operation on the lumbar sympathetic chain were likewise studied. In contrast to Danielopolu, Derom did not find that simple section of the chain between the last lumbar and first sacral ganglion affected the vasomotor responses in the limb of the corresponding side. In order to obtain a complete loss of vasomotor response in the lower extremity, he found it necessary to remove the first, second, and third lumbar ganglia and the intervening chain, or completely to section all communicating rami at these levels. Unilateral adrenalectomy was found to be without effect, a result which by this time should no longer be surprising.

Derom does not attempt to explain clinical results at variance with his experiments. He believes that results are often relative and a matter of degree, and a beneficial effect does not require a maximum vasomotor change. In other words, though a patient may lose a quart of blood at an operation, only a pint of transfused blood may be necessary to save his

life, likewise, it isn't always necessary to produce complete vasomotor paralysis in order to save an extremity afflicted with Raynaud's or Buerger's disease. Therefore, operations not entirely sound from a physiological standpoint may sometimes be beneficial enough to warrant their employment.

JOHN MARTIN, M.D.

Brunschwig, A., Humphreys, E., and Roome, N The Relief of Paroxysmal Hypertension by Excision of a Pheochromocytoma *Surgery*, 1938, 4 361

The authors present an interesting report of the removal of a rare tumor (paraganglioma), followed by the relief of symptoms. A woman, aged forty-one, complained of "attacks" characterized by constriction in the head, pain in the abdomen, nausea, and often vomiting. This was followed immediately by weakness in the legs and purposeless but controllable movements of the extremities, usually on the right side. Consciousness was not lost. The attacks had become progressively more frequent in the last eight years, and there was a premonition of the attack for one or two minutes.

The history and physical examinations were negative except for a sinus arrhythmia. The normal blood pressure was 146/98. During 2 "attacks" the blood pressure, which was taken almost continuously, rose as high as 270/140 and 236/136 soon after the onset. Intravenous pyelograms were negative, but the retroperitoneal injection of air revealed a rounded mass at the upper pole of the left kidney. A diagnosis of left suprarenal tumor was made. The tumor was removed through the gastric hepatic omentum and the parietal peritoneum. It shelled out easily. Histological study confirmed the pre-operative diagnosis. The patient has had no recurrence of the attacks after a period of one year from the time of operation.

Eleven similar cases in which operative treatment was successful are reviewed. These tumors are eventually fatal, but they have a rather characteristic clinical syndrome which should lead to a correct diagnosis and their removal.

ADRIEN VERBRUGGEN, M.D.

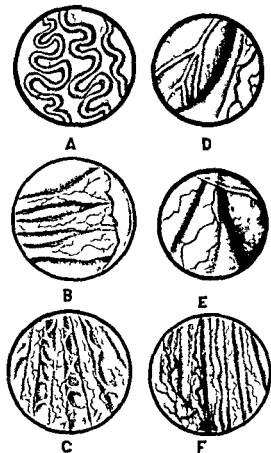


Fig 2 A Varicose vessels of cauda equina (red tortuous structures). Note the three normal nerve roots (straight structures) and their fine blood vessels lying beneath the varicose vessels. B Discolored distorted portion of three nerve roots of cauda equina (at right of field). Note normal appearance of same roots at left of field. At operation an extruded nucleus pulposus was removed from the region of the abnormal roots. The serrated semilunar structure at extreme right represents the edge of the arachnoid membrane (magnified) where parted by the tip of the instrument. It has a thickened white opaque appearance which is distinctly abnormal. C Showing 4 apparently normal nerve roots with intervening hour glass strands chronic adhesive arachnoiditis. D Edge of normal nerve root with its blood vessels at right of field (moderately magnified). At left of field is seen the ovoid mass partially covered by arachnoid membrane which is believed to represent extension of a carcinomatous metastasis from the fifth lumbar vertebra. E Three closely packed enlarged edematous looking nerve roots which were found to be heavily infiltrated by metastatic medulloblastoma cells when the patient came to autopsy. At right of field is a granular (dull red) mass representing tumor tissue. Across the top of the field stretches an edge of arachnoid membrane. Its transparent appearance is normal. F Example of neuritis of two nerve roots of the cauda equina (at left of field). Note dilated vessels and diffusely injected appearance of these roots. At right of field two normal roots with normal vessels are shown. The slightly tortuous (white) structure in the center of the field represents the filum terminale. At lower left a small bit of epidural fat may be seen.

jective sensory disturbances. There was no history of significant trauma or illness.

The examination showed spastic paraplegia, absence of the abdominal reflexes and a sensory level at T 12 more marked for impairment of pain and temperature than for tactile, vibratory and muscle joint tendon perception. There was also an indefinite sensory level at T 8, an automatic bladder and a loss of rectal sphincter control.

Manometric studies revealed no evidence of subarachnoid block; the cerebrospinal fluid was clear and contained 85 mgm. of protein, the globulin was 2+. Roentgenograms of the spine showed no abnormalities. The blood count, blood spinal fluid and Wassermann tests were normal.

The clinical impression was that of intramedullary neoplasm (probably a glioma) of the spinal cord in the lower thoracic region. Varicose vessels of the spinal cord were considered a second diagnostic choice.

The myeloscope was inserted between the spinous processes of L 1 and L 2 without difficulty. The pathology was immediately apparent and consisted

of numerous extremely tortuous enlarged blood vessels which lay free within the subarachnoid space. These vessels extended in both a caudal and a cephalad direction and were not attached to any of the nerve roots. The vessels were 4 or 5 times the diameter of those supplying the nerve roots (Fig 2). The roots themselves appeared entirely normal. They were white, non-adherent and undistorted and their vascular supply presented no abnormal characteristics.

The condition was diagnosed as varicose vessels of the cauda equina, apparently of congenital type. Presumably these vessels emanate from the thoracic lumbar segments of the spinal cord.

Exploratory laminectomy (T 8 to T 11) revealed extensive varicosities of the spinal cord. The varicose vessels coursed in a caudal direction and were undoubtedly continuous with those visualized by myelography. The spinal cord exhibited no evidence of neoplasm. A small collection of clear extra-arachnoid fluid was encountered at the site of laminectomy but this was apparently not of sufficient proportion to cause spinal-cord compression.

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Eleven similar cases in which operative treatment was successful are reviewed. These tumors are eventually fatal, but they have a rather characteristic clinical syndrome which should lead to a correct diagnosis and their removal.

ADRIEN VERBRUGHEN, M.D.

SURGERY OF THE THORAX

TRACHEA LUNGS AND PLEURA

Belsey R. *Extrapleural Pneumothorax* *J Thoracic Surg* 1938 7 575

Although Tuffier in 1891 induced the first extrapleural pneumothorax no serious attention was given to this form of collapse therapy until Graf in 1936 reported on his experiences. Since then numerous reports have appeared in the literature.

Extrapleural pneumothorax was introduced at the Brompton Hospital in London early in 1937 by Roberts to help a large group of patients for whom no other form of collapse therapy seemed possible. This group included early cases too acute for thoracoplasty and in whom intrapleural pneumothorax was impossible and late cases with lesions too wide spread or with a general condition too poor to warrant a thoracoplasty. Further indications were developed but these remained the fundamental ones. Contraindications have been as little understood as the indications, but in general Roberts maintains that extrapleural pneumothorax should never be used when a thoracoplasty can be safely done.

The operation consists in an extrapleural separation of the lung from the chest wall and mediastinum so that it may collapse concentrically toward the hilum. The separation is carried out in the plane between the parietal pleura and the endothoracic fascia and carried down to such a level that when the floor of the space became straight the pneumothorax would still be sufficiently extensive to prevent the reopening of the collapsed cavity.

In the Brompton Hospital Series general anesthesia was used instead of local. Cyclopropane and nitrous oxide oxygen ether proved satisfactory because of the high oxygen concentration made possible the quietness of the breathing and the absence of coughing. General anesthesia was preferred to local because of the ability to maintain positive pressure should the pleural space be entered and the whole lung collapse in a patient with low vital capacity in order to allow rapid enlargement of the thoracic opening should any serious bleeding occur and finally because it allows one to keep the trachea and bronchi free from secretions by repeated aspirations through a rubber catheter.

The approach to the extrapleural space was made through the bed of the fourth rib after subperiosteal resection of from 2 to 3 in. of its posterior portion. The cleavage plane was developed by blunt dissection with the finger and then under direct vision with the aid of illuminated retractors. For lesions of the upper lobe the pleura was stripped to the level of the seventh or eighth rib posteriorly, the third or fourth rib anteriorly and to a level below the line joining these points laterally. Freeing of the lobe on all its aspects was essential to success. Airtight closure of the wound in the chest wall was carefully performed.

The first refill of air was given on the day of the operation and another the next day. A positive pressure of from 10 to 20 cm. of water was produced. Following the first two days the refills were given at intervals increasing a day at a time. After establishment of the pneumothorax the refills were needed only at two or three week intervals. Maintenance of a positive pressure was considered important. The air was introduced through the first inter space in the midclavicular line.

Patients were strictly kept in bed for from four to six weeks after the operation and then returned to the sanatorium for six months of graduated rest and exercise.

There was minimal operative shock and very little postoperative reaction. Subcutaneous emphysema was constant but of short duration. Serosanguinous effusion developed in all cases but was usually limited and became absorbed spontaneously. Delayed hemorrhage occurred in 4 cases but was serious in only 1 and in this case was fatal. There was no case of atelectasis of the uncollapsed lower lobe.

Up to the end of 1937 Roberts had performed 33 operations at the Brompton Hospital. Ten early operations were done because of the failure of intrapleural pneumothorax. In 9 of the cases the disease was bilateral. Cavity closure and clinical improvement was obtained in all and the positive sputum disappeared in 7. Of 18 patients with an advanced condition 14 were benefited in 9 the cavities were closed. Two deaths occurred in this group. In 2 cases only a lateral pneumothorax could be established and in 3 the operation was abandoned because of dense adhesions between the pleura and the chest wall.

Churchill at the Massachusetts General Hospital in Boston has performed the operation on 7 patients with cavity closure in 6 and with no deaths. A tuberculous infection of the extrapleural space occurred in 1 case.

Belsey concludes that extrapleural pneumothorax is a method of obtaining selective and effective concentric relaxation of the lung, when other methods have failed and when the patient is too sick for thoracoplasty. Neither the operation nor the postoperative management is a simple procedure and it is not yet known how severe the late complications may be.

RICHARD H. MEADE, JR., M.D.

Haugenstein O. H. *Thoracoplasty for Tuberculosis and Chronic Empyema Through Short Incisions* *J. Tl. and Surg.* 1938 8 60

The author has improved his previously reported technique of thoracoplasty by means of short incisions. A great aid in this technique is the use of the notched Semb periosteal retractor and pericostal raspator as of the author's design.

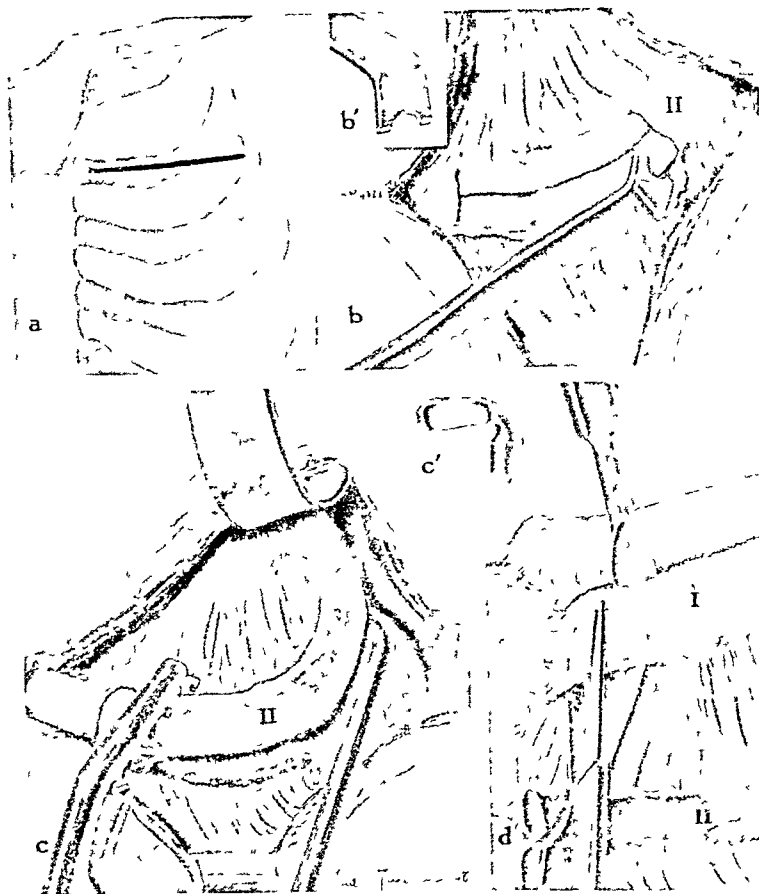


Fig 1 The technique of rib removal employing sharp periosteal raspatories (a) The incision for the anterior operation (the skin incision for the posterior operation remains the same as shown in Fig 1) (b) The Semb periosteal raspatory is used to free the edges of the rib (c) The cartilage is divided and the raspatories are used to free the upper and lower surfaces of the rib The intercostal retractor elevates the structures of the chest wall (d) Manner of liberating the first rib, the division of the cartilage is also shown Occasionally the first rib cartilage is ossified and must be cut with rib shears In the performance of anterior extrapleural apicolysis, if the lung is adherent anteriorly its mobilization may be facilitated by rongeurage away more cartilage or even a portion of the sternum

In the usual procedure, with the patient lying supine, a short incision is made over the second rib anteriorly The costal cartilages of the first, second, and third ribs are removed with liberal portions of the ribs themselves A special retractor with a long narrow blade elevates the muscle of the chest wall off the rib during separation from the periosteal bed At the time of the anterior operation the author does an extrapleural apicolysis From ten to fourteen days later the residual upper 3 ribs with the transverse processes are removed through a posteriorly placed vertical incision At the same time the fourth, or even from the fourth to the seventh ribs may be

cut and their short angular paravertebral segments removed if desired These latter ribs are later removed through a short transverse anterior incision However, these lower ribs are not excised all the way up to the costal cartilage If 3 lower ribs are to be excised anteriorly 1 oblique incision is made, if 4 ribs are to be removed 2 separate horizontal button-hole incisions are used

The author has seen a few instances of dyspnea attending removal of the long segments of the lower ribs by this method, as may occur also by the conventional method However, the reactions in general are less severe and with the use of sharp perios

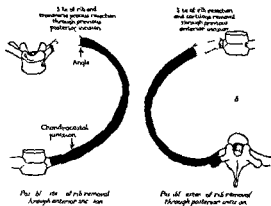


Fig. 2

teal respiratories bleeding is minimal. No instance of an unfirm anterior chest wall has been noted following this procedure.

The author's technique of extrapleural apicectomy through the anterior incision is as follows: the first and second intercostal muscle bundles together with perichondrium are cut near the sternum. With the tips of the fingers or with gauze on the fingers or held in a hemostat pressure is applied along the lower surface of the second and third ribs and a plane of cleavage is established posteriorly and laterally outside of the endothoracic fascia. Then the endothoracic fascia is similarly separated from the sternum and clavicle. As Sibson's fascia is visualized it is cut. After satisfactory separation of the endothoracic fascia and collapse of the cavity, ribbons of catgut are woven over the depressed dome of lung. Posteriorly the catgut ribbon is anchored as low as possible without tension usually between the fourth and fifth ribs and anteriorly to the perichondrium in the second intercostal space. A small silver clip attached to the catgut over the summit of the lung facilitates later x-ray determination of the position of the apex. Still an unsolved problem is the proper management of the large extrapleural space.

EARLO LATIMER, M.D.

Morin J. Michetti D. and Dwelshauvers F. Superior Topographic Thoracoplasty: Future of the Method. Partial Thoracoplasty and Pneumolysis (La thoracoplastie supérieure topographique la fin de la méthode thoracoplastie partielle et pneumolyse) *Arch. int. chir. et appl. respir.* 1938 13 24.

The School of Leysin in Switzerland has sought to limit as far as possible the extent of the surgical intervention in upper partial thoracoplasty. The rib resection is limited to the diseased area and the exact number and extent of the ribs to be resected are determined before operation by a careful study of the roentgenograms. The collapse obtained should approximate as closely as possible that se-

cured by a successful selective pneumothorax. The use of the muscle splitting incisions of Picot and Roux and of light formalization of the posterior periosteum has been of value. The authors consider the retractility of the lesions to be the most important factor in the success of the thoracoplasty.

Altogether there were 106 cases of partial upper thoracoplasty studied. No case in which more than 8 ribs were resected was included and in all there were as many as 4 resected. All patients had open cavities which had not responded to rest treatment and for which intrapleural pneumothorax had not been successful. All operations had been performed by Picot at Lausanne and at Leysin and by de Rham at Leysin.

After having been followed for from many months to several years 55.7 per cent of the cases were considered to be clinically cured with disappearance of the bacilli in the sputum. Among 9 cases with resection of only 4 ribs the result was good in 7. Among 21 cases with resection of 5 ribs the results were good in 11. The total mortality was 26.4 per cent; the operative mortality 8.3 per cent. In studying the causes of the operative mortality it was seen that 4.5 per cent of the deaths were attributable to the shock of the operative procedure; the remaining deaths were due to wound infection or to rupture of large subpleural cavities during the operation.

Postoperative pulmonary complications occurred in 23 cases (21.5 per cent) and were fatal in 11. These figures were compared with those of Maurer and Rolland who reported 36 postoperative complications (21.3 per cent) among 169 cases, 12 of which terminated fatally. Among the 100 patients who survived the operation 70 had had preliminary phrenic paralysis. Of the 19 (21 per cent) had pulmonary complications which proved fatal in 11 cases. Among the other patients there were pulmonary complications in 4 (13.2 per cent) with a fatality in 1 of these. Maurer and Rolland found that 47 per cent of their patients with preliminary phrenic paralysis had such complications. The exact nature of the pulmonary changes was not understood but atelectasis was not considered an important factor.

In a study of the causes of failure the most important factors were considered to be the age of the cavities and the character of the surrounding tissue. The presence of healthy tissue about a cavity or evidence of retraction as shown by slanting ribs or upward convexity of interlobar fissure shadows indicated the likelihood of success. The migration of cavities outside of the zone of collapse can be prevented at times by resection of the first rib being left for the second stage of the operation as suggested by Bernou Fruchaud. Prolongation of the intervals between stages which permits resection to take place also accounted for some failures.

The authors consider that sanatorium care should be given patients until their lesions have become stabilized. When thoracoplasty is performed without this preparation the results are not so good.

In a study of the time needed for the sputum to become negative in their successful cases, it was found that in one-half of the cases the sputum became negative within three months, and it was positive in only a very few eight months later. The time needed depended upon the amount of secretion and the age of the cavities.

For cavities encircled by the first rib the value of apicolysis with or without plombage is admitted. Extrapleural pneumothorax can usually secure early good results in the same type of cases which are most amenable to topographical thoracoplasty. When the condition of the patient makes it feasible to use the latter procedure it should always be chosen, as it is permanent and does not expose the patient to the dangers of later re-expansion of the lung or of perforation of the cavity. Because of its relative harmlessness the establishment of an extrapleural pneumothorax can be used in patients too feeble to withstand a thoracoplasty, in patients with active disease, and in bilateral cases. It is also particularly valuable for collapsing cavities in the juxtamediastinal and paravertebral areas.

RICHARD H. MEADE, JR., M.D.

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The value of apicolysis for adequate collapse of the lung in pulmonary tuberculosis has been recognized for a long time. In recent cases at the Laennec Hospital in Paris, the importance of the addition of this procedure to radical thoracoplasty has been emphasized in many instances. Tsoutis writes that they believe that apicolysis should be considered during the course of upper partial thoracoplasty when the general condition of the patient during the operation is satisfactory and when the local conditions make it possible. The chance of success is greatest when the cavities are relatively young and are not situated at the periphery. Careful roentgenographic studies should be made in order that the site of the cavity can be localized and also to demonstrate the mobility of the walls of the cavity. A rigid walled cavity at the periphery of the lung usually indicates that apicolysis will be difficult, if not impossible.

Eight case reports are presented. In 4 cases apicolysis was not possible and in spite of extensive thoracoplasties the cavities failed to collapse completely. In the other 4, cavity closure was accomplished after partial upper thoracoplasty with apicolysis, although in 2 of these the mobilization of the apex was incomplete. In 3, disarticulation of the ribs and resection of the transverse processes were considered necessary because of the posterior position of the cavities.

The technique now in use is as follows: after the ribs have been exposed in the usual manner, an incision is carefully made along the upper border of the third or fourth rib, and the fibers of the intercostal muscles are divided. The endothoracic fascial plane is found and separation carried out under the rib

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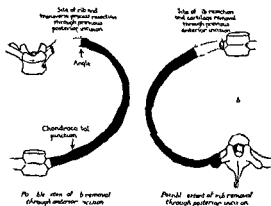


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tive pericarditis Simple adhesion between the pericardial layers usually is asymptomatic and only when the fibrin deposits become organized in the acute stage does the soldering of the pericardial layers into thick fibrous indurations become pathologically significant because they embarrass the cardiac activity and produce the clinical picture of cardiac decompensation characteristic of the disease The fibrous process may involve the myocardium or the parietal pericardium and the tissues of the anterior or posterior mediastinum and attach the heart to the thoracic wall or vertebral column These variations are only grades of indurative mediastinitis and have no basic significance

Of 48 patients seen at the Medical Clinic in Lund in whom rheumatic affection clinically complicated pericarditis one third died 12 were left invalids and 8 were left almost or completely asymptomatic which results show that rheumatic pericarditis does not always offer a grave prognosis

The clinical diagnosis is often difficult Roentgenography does not always give clear pictures in the exudative form as in the differential diagnosis of myocarditis with marked cardiac dilatation In such cases a valuable diagnostic aid is aspiration of the pericardium obliquely upward to the left of the xiphoid process next to the insertion of the seventh rib The cardiac decompensation develops gradually often over a period of years during which time the acute pericarditis is latent The pericardial exudate cannot always be aspirated completely and the fibrinous deposits may remain All cases of acute serofibrinous pericarditis should therefore be observed carefully for years for the possible development of indurative pericarditis Early operation (pericardiectomy) before cardiac decompensation develops is indicated When the indurations are incrustated with calcium the course is easily seen roentgenographically but then operation is most difficult and is contraindicated The diagnosis should be made before this happens

Because of the long latent period the symptoms are few such as gradually developing symptoms of general cardiac insufficiency (dyspnea on exertion and cyanosis) palpitation enlargement of the liver and spleen and ascites edema of the lower extremities appears late A striking picture when the cardiac decompensation has reached its fastigium is the marked filling of the venous system pronounced cyanosis and very prominent veins in the neck and the arms This condition may last for years As the heart is surrounded by indurations it cannot dilate in the decompensative process which gives this condition its most important characteristic—a small quiet heart in marked contrast to the severe decompensation There is also the so-called *pulsus paradoxus* (disappearance of the pulse on inspiration with recurrence or increased amplitude on expiration) The increased venous pressure is the earliest and most constant symptom whereas the arterial blood pressure is usually low with low amplitude Besides the calcareous incrustation of

the pericardial layers roentgenography reveals rigid cardiac contours and complete or partial absence of pulsations of the left and right contour of the heart The size of the heart varies according to whether or not cardiac dilatation is present

Pericardiectomy has given marked and prolonged relief to many patients even after many years of severe cardiac decompensation Whenever symptoms of venous stasis develop pericardiectomy should be considered A more intimate co-operation between physicians and surgeons will lead to more favorable operative results LOUIS KUEHL M.D.

Tengwall E. Indurative Pericarditis and Its Operative Treatment (*Die schwerste Perikarditis und ihre operative Behandlung*) *Acta chir. Scand.* 1934 81: 118

In cases of indurative pericarditis co-operation between the internist and surgeon is necessary not only for the diagnosis but also for the best possible preparation of the patient before the operation in order that cardiac complications and edema can be prevented as well as for the postoperative care of the heart

Of the 6 patients with indurative pericarditis operated upon by the author 3 showed calcareous incrustations in the pericardium and an unfavorable course However 3 patients with indurative pericarditis without calcareous deposits were restored to health and rendered capable of work although they were invalids before the operation Operative intervention in patients with calcareous incrustations should be weighed carefully when the roentgenogram shows deposits on the anterior or posterior aspect of the heart Possibly the outlook is better when the anterior pericardium is free of calcium and is easily separable and only the posterior part of the heart is fixed in a calcium incrustated pericardium as the myocardial injuries are not as great and the heart can recover more easily On the other hand, the operative results in the patients with indurative pericarditis with concretions of the pericardium and without calcium deposits were much better In the final analysis the result of the operation depends upon the extent of injury to the myocardium and the ability of the heart to overcome the efforts of operation with suitable after treatment Much also depend upon how far the surgeon ventures in the separation of the pericardium In order that the ascites and edema be reduced it is necessary that the ostia of both veins into the heart be mobilized as much as possible

The thoracotomy was done according to the method of Schmindegen resection of the cartilages of the third to the fifth ribs and of about 2 cm. of the ribs and also of just as broad a strip from the left sternal portion The separation of the pleura was usually easy The pericardium was then incised after the proper border between it and the heart was found This is easy if the pericardium is not incrustated with calcium The operation is easily done under local anesthesia

Subsequent to this publication the author operated upon a seventh patient having an old cardiac lesion with symptoms for three years. The heart and liver were both enlarged with ascites. Roentgenography revealed a narrow lime shale on the anterior and posterior aspects of the heart, approximately corresponding with the entries of the venæ cavæ. Four months after operation the patient was subjectively benefited. Possibly no fully satisfactory result can be expected in cases in which some organic cardiac lesion with enlargement of the heart is present.

LOUIS NEUWELT, M D

ESOPHAGUS AND MEDIASTINUM

Le Fort, R., and Decoulx, P. *Bullets in the Heart and Mediastinum. Late Results in 55 Cases after More than Twenty Years* (Projectiles du coeur et du médiastin. Resultats éloignés de 55 cas apres plus de 20 ans). *J de chir*, 1938, 52, 1.

There have been many controversies among surgeons concerning the immediate and late dangers of, and the indications for, extraction of bullets penetrating the thoracic cavity.

These statistical observations refer to a series of 100 cases which occurred during the war and in which operation had been performed. In this series the mortality following surgical intervention was found to be 7 per cent.

In a follow-up study of these cases, only 55 patients could be traced and they presented the following distribution of thoracic bullet wounds: heart, 7 cases, pericardium, 7 cases, superior mediastinum and region of the large vessels at the base, 8 cases, pulmonary root, 13 cases, posterior mediastinum, 7 cases, and prevertebral region, 9 cases, in 4 cases the bullets were not extracted.

From a detailed study of these records, the following practical conclusions may be drawn:

Non-extracted bullets of the thoracic cavity produce an average incapacitation of 35 per cent, whereas extracted bullets produce an average incapacitation of only 24 per cent. The proportion of complete recoveries was 25 per cent in the cases in which the bullets were not extracted, and 57 per cent in cases in which they were extracted. These figures clearly show that surgical intervention for bullet extraction should be considered whenever possible and should be given preference over any conservative method.

It was found also that the extraction of bullets from the mediastinum was prognostically somewhat more favorable than the extraction of bullets from the heart. Among the mediastinal bullets, the most serious are those which involve the pulmonary root. In general, the following distribution of percentage incapacitation was found for the various bullet wounds involving the thoracic cavity: heart, 30 per cent, pericardium, 14 per cent, great blood vessels, 22 per cent, pulmonary root, 31 per cent, posterior mediastinum, 26 per cent, and prevertebral region, 17 per cent.

It is interesting to note that the most commonly encountered functional disturbances were of respiratory origin for all types of lesions. In the majority of the cases the most common sequelæ were pleuropulmonary manifestations, pulmonary sclerosis, emphysema, and respiratory insufficiency. Even in cases in which the lesion involved the myocardium, pericardium, large vessels, or the cardiac nervous plexus, the circulatory system was surprisingly little affected. The most commonly encountered late sequelæ also involved the respiratory system.

In spite of these findings, the problem of the indications for surgical intervention still remains open to further investigation. It should be noted, however, that bullets in the heart which have not been extracted frequently cause sudden fatal accidents, sometimes twenty or more years following the trauma. The most common accidents in this respect are embolism, thrombosis, aneurysm, and sudden syncope.

The electrocardiograms from individuals in this series from whom the bullet was surgically extracted were invariably normal, or nearly so, twenty years after the original trauma. RICHARD E. SOMMA, M D.

Phillips, C. E. *Mediastinal Infection from Esophageal Perforation*. *J Am M Ass*, 1938, 111, 998.

Mediastinitis due to perforation of the esophagus has in the past been considered a fatal condition usually.

This author presents a series of 20 cases of mediastinal infection from esophageal perforation, and reports 3 deaths, all of which occurred under different circumstances and might have been prevented.

The esophagus is composed of soft structures and its vulnerability to perforation is, therefore, very striking. After perforation has occurred, the constant motion of the mediastinal structure predisposes to a rapid dissemination of infection. Perforations of the esophagus occur for the most part in its upper portion, and are usually followed by infection. Once infection is liberated in the periesophageal spaces of the neck, the course of spread depends on the amount and virulence of the infective material.

When the infection is relatively small, it may remain localized in the neck for some time and then gradually descend into the superior mediastinum and along the great vessels in the base of the neck. This course of extension explains the lateral swelling of the base of the neck.

The diagnosis of mediastinal infection from esophageal perforation must be made promptly and the abscess accurately localized to assure success in treatment. The following are the important diagnostic points:

1. A history of injury following the swallowing of some sharp substance, or of perforation during instrumentation.

2. Immediate pain, tenderness, and difficulty in swallowing, followed later by fever, swelling, and subcutaneous emphysema.

3 X rays may show a foreign body emphysema or irregularities in the presence of a barium opaque meal

4 Endoscopic examination may show the perforation

The spread of the infection is varied (a) it may slowly perforate an injured mucosa and later the mediastinum (b) a virulent infection with a minimum of trauma may set up active mediastinitis (c) a minute perforation may remain walled off from the mediastinum until the opening into the esophagus closes and then a fulminating mediastinitis results (d) a wide opening in the mediastinum leads to rapidly spreading emphysema and mediastinitis

The penetration of infection into the great blood vessels resulting in septicemia is the chief threat to life. Serious secondary hemorrhage occurred in 2 of the author's patients 1 of whom recovered. A slough of the internal jugular vein occurred in 1 case with recovery. A slough of a part of the esophagus occurred in 1 case followed by hemorrhage and death. The thoracic duct was injured in 1 case but recovery followed. One death resulted from a double pneumothorax. Another was due to infection principally because the patient refused early operation.

The surgical treatment has for its objectives

- 1 Localization of the lesion
- 2 Surgical approach evacuation of the abscess
- 3 Release of pressure
- 4 Sterilization of the abscess cavity with a diluted solution of sodium hypochlorite
- 5 Continued disinfection until healing is complete

Infection in the retropharyngeal and superior mediastinal spaces is treated by an incision along the anterior border of the sternocleidomastoid muscle. The muscles are separated and the lower pole of the thyroid is elevated which procedure gives easy access to the superior mediastinal spaces. About 3 Dakin tubes are placed on each side of the esophagus with care not to cause undue pressure on the pleura. Irrigation is done every two hours until the infection subsides.

When the infection is in the posterior mediastinum the surgical attack should be made from the dorsum. Two inches of the posterior end of two ribs below the point of perforation are resected the pleura is displaced outward and access is obtained to the posterior mediastinum. When barium sulfate has been used in localizing the abscess and this barium sulfate is encountered in the field of operation the Dakin tubes are placed immediately and the wound is closed to the tubes. In all cases of mediastinitis a feeding tube is passed through the neck and down the esophagus. This is left *in situ* until the esophagus is healed usually for a period of about ten days.

J DANIEL WILLEMS MD

Pearse H E Jr Mediastinitis Following Cervical Suppuration *Ann Surg* 1938 108 539

Mediastinitis may originate from many different sources and may range from a simple inflammatory

process to a diffuse suppurative phlegmon which is often lethal. The author has for many years shown a particular interest in this condition which finally led to anatomical and post mortem dissection for the purpose of studying the path and spread of cervical infection. One hundred and ten cases of mediastinitis have been collected 99 of which were obtained from the literature and 11 from the author's own experience.

In 64 patients he found the causative factor to be perforation of the cervical esophagus. Of these 33 were operated upon and 24 recovered. Of the 31 patients who were not operated upon 4 recovered.

In 13 patients the causative factor was suppurative lymphadenitis. All were operated upon and 7 recovered. The remaining 6 died.

In 11 patients the causative factor was a retropharyngeal abscess. Of these 9 were operated upon and 6 recovered. Of the 2 who were not operated upon 1 recovered.

Pentostomal abscess was present in 8 patients. Operation was performed on 4 with 2 recoveries. All 4 of those who were not operated upon died.

In 6 patients mediastinitis followed tracheotomy. Of these operation was performed on 2 1 of whom recovered. The remaining 4 were not operated upon and 1 recovered.

Spondylitis of the cervical spine occurred in 3 patients 2 of whom were operated upon both patients recovered. The one who was not operated upon died.

There were 3 cases of postoperative thyroidectomy followed by suppurative mediastinitis. Operation was performed on all 3 patients only 1 of whom recovered.

The causative factor in 2 cases was Ludwig's angina. Both patients were operated upon and 1 recovered.

The retrovisceral space conveys infection from perforation of the esophagus retropharyngeal abscess and spondylitis of the cervical spine. The carotid sheath conducts the infection in most instances of suppurative lymphadenitis pentostomal abscess and Ludwig's angina. The pretracheal space is the course followed by infection following tracheotomy or thyroidectomy.

The mediastinitis which follows cervical suppuration results from a dependent spread of infection along the fascial planes. If this gravitation of pus could be blocked the chest infection would be prevented. Theoretically this could be done by a prophylactic operation by packing the spaces in the neck. Such a procedure is indicated in cases in which the progress of the infection is very rapid. Even if it is too late to interrupt the gravitation drainage of the space can still be established with release of tension and prevention of extension to the chest. In the absence of a rapidly spreading infection there is much less indication for such prophylactic blocking of the fascial spaces.

The management of mediastinitis involves a surgical attack and drainage of the infection just as in

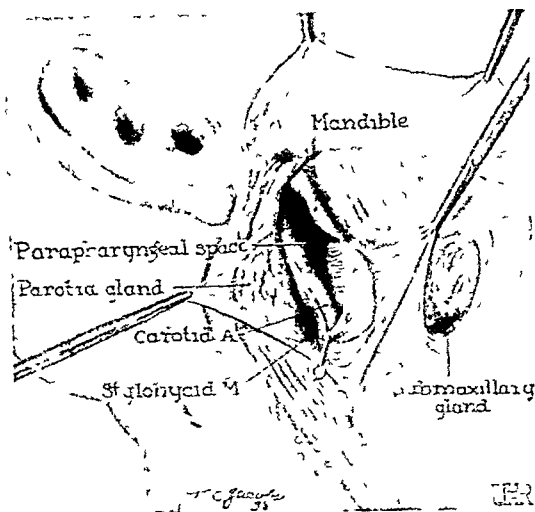


Fig 1 The parapharyngeal space seen from the outside. The fused fascia is left in front to separate it from the submaxillary space. The parotid gland is turned back in this dissection for exposure. This could not be done so widely at operation without facial nerve injury. The parapharyngeal space extends up behind the angle of the jaw and ends below around the carotid artery. (Courtesy of J B Lippincott Co.)

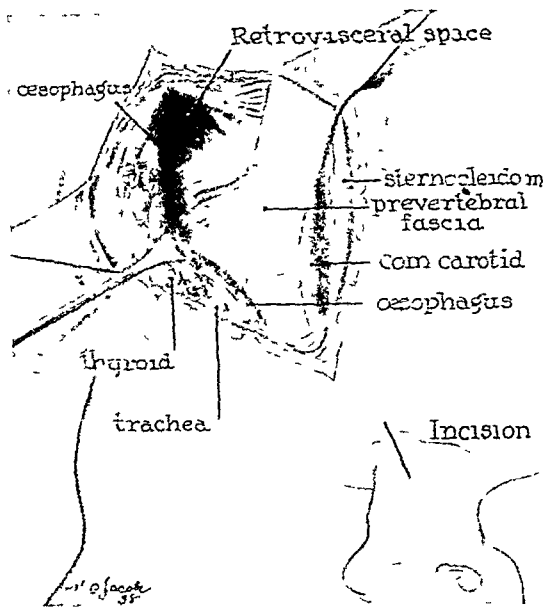


Fig 2 Looking down into the posterior mediastinum through the retrovisceral space, as it is seen at operation. Orientation is easier if the drawing is turned so the head is up. The thyroid gland, trachea, and esophagus have been retracted mesially, while the carotid artery, jugular vein, and sternocleidomastoid muscle are displaced laterally. This exposure permits visual inspection of the space.

fection in a more accessible location. In this series of 110 cases, the mortality in patients operated upon was 35 per cent, in contrast to the mortality of 85 per cent in those not operated upon. Drainage was accomplished through the esophagoscope in 13 cases, through the chest wall in 14, and through the neck in 41 cases.

The incision in the neck is usually made parallel to the lower medial border of the sternocleidomastoid muscle, though it may be placed transversely to follow the skin folds. The sternocleidomastoid muscle is retracted and the fascia which is lateral to the sternothyroid muscle is divided to expose the carotid sheath and thyroid gland. Lateral retraction of the vessels and medial displacement of the thyroid gland will expose the trachea and esophagus. A certain amount of pus will usually be encountered and drains should therefore be placed at the bottom of the cavity.

Some surgeons prefer the approach behind the sternocleidomastoid muscle, but danger of nerve injury is greater in this location.

Suppurative mediastinitis from descending cervical infection is not always a hopeless condition, but is amenable to cure if energetic measures are taken to treat it. Familiarity with the anatomical arrangement of the cervical fascia and the spaces that connect the neck and chest is required for execution of the surgical procedures that are necessary. Persistence in postoperative treatment is most essential.

The author also presents a minutely detailed description of anatomical dissection of the neck and its various structures and spaces in relation to each other. The article is accompanied by many excellent drawings and diagrams. J. DANIEL WILLEMS, M.D.

SURGERY IN THE DIABETIC PATIENT

Collective Review

WALTER H NADLER M D Chicago Illinois

THE current literature pertaining to diabetes is very extensive because of investigations in the fields of endocrinology and metabolism and the introduction of protamine zinc insulin. The important contribution on the subject prior to 1936 and 1937 are included in a text by Falta (21) and in the admirable monograph of Joslin (36). Selective critical reviews by Wilder (81-82) published annually for several years have ably considered various phases of the problem. Root and Marble (59) have summarized literature that appeared after the publication of the last edition of Joslin's book. The following review is concerned with articles published within the last two years which may be of special interest to the surgeon.

GENERAL CONSIDERATIONS

The subject of diabetes deserves serious study by every physician because as stated by Root and Marble (59) "There are so many diabetics and they live so long." Statistical evidence indicates that the number of persons with diabetes in the United States is growing; the mortality figures show an increase that is both absolute and relative. Joslin, Dublin, and Marks (38) report that although the average length of life of diabetics has definitely increased in recent decades, the death rate is still much in excess of those for the general population. The death rate at all ages in the latter part of the period from 1926 to 1929 was 75 per cent below that from 1897 to 1923. The greatest gains have been made in young diabetics and the most rapid decline in mortality occurred after insulin became available. The expectation of life has greatly increased. At the age of ten the increase between the pre-insulin years mentioned and the period from 1926 to 1929 is estimated at about thirty years. With advancing age the increase is progressively less.

Ponteva (54) reporting results of treatment in Finland states that after the use of insulin mortality in the clinic fell from 19 per cent of 86 cases to 6.8 per cent of 645 cases treated between 1923 and 1936. Coma as a cause of death was reduced from 81 per cent to 27 per cent. The

marked increase in the number of diabetic was greatest in elderly women. In September 1930 it was determined that 51 per cent of the patients previously treated were still living. As the cause of death, diabetes came first (45.1 per cent), pulmonary tuberculosis second (18.8 per cent) and circulatory diseases third (15.3 per cent). The highest mortality occurred among the peasant class and the best clinical results were obtained in the group of educated patients.

PATHOGENESIS

The outstanding recent contribution is the report from England by Young (85) of the production of permanent diabetes in dogs by means of injections of substance of the anterior lobe of the pituitary gland. Permanent experimental diabetes without pancreatectomy had not hitherto been effected although its production was awaited as the outcome of Houssey's brilliant investigations. Young reports that of 25 dogs injected with extracts made from the fresh frozen anterior lobe of the pituitary gland of the ox only 1 failed to develop glycosuria, ketonuria, and polyuria after repeated intraperitoneal injections.

The results reported by Young together with other investigations concerning the rôle of the pituitary and other endocrine gland in carbohydrate metabolism constitute evidence against unitarian theories of the origin of diabetes as stated by Peters (51). This writer is among those who believe that diabetes can no longer be considered a disease entity and that among the cases labeled diabetes may be found a variety of diseases. As a result each patient should be viewed as an individual problem demanding thorough examination and analysis.

Bjerring (6) has demonstrated the presence of small quantities of a blood sugar raising principle (the diabetogenic hormone) in the urine of healthy subjects. In some diabetics it was possible to demonstrate an absolute increase of the hormone in the urine; in others no greater quantities could be detected than are present in normal individual. In a single case it was possible to check the excretion of the hormone by treatment with insulin. Large quantities of the hormone were demonstrable in the urine of

GLYCEMIA

pregnant women While the experiments support the dualistic theory of the pathogenesis of diabetes, the material presented is admittedly insufficient to warrant a definite answer to the question whether there are two forms of diabetes mellitus, a pancreatogenous and a hypophyseal form

Impairment of liver function may be responsible for various manifestations that are apt to be attributed to the diabetes, itself Locascio (45), in a study of 20 patients, shows that the height of polypeptidemia observed is in direct relation to the functional efficiency of the liver

ASSOCIATED PATHOLOGY

Kitchell (41) reports on 50 patients who presented both a positive blood Wassermann reaction and undoubted diabetes, as shown both by blood and urine studies In 31 cases the anti-luetic treatment was so inadequate that no effect on the diabetes could be expected In 15 cases adequately treated no effect on the diabetes was observed In 4 cases, however, the diabetic symptoms disappeared The recovery is believed to be more apparent than real since these patients were followed up only a short time

As regards hypertension, Strauss (71) found a systolic pressure of 160 mm of mercury or more in 28 per cent of 500 diabetics In contrast, among 500 non-diabetic individuals of comparable age the incidence of hypertension was less than half as great Most of the patients were over fifty years of age In more than a third of the patients the diabetes had been present for a period of at least eight years

Since gall stones and diabetes often coexist in women past the age of forty, Allen (2) believes that everyone who has cholelithiasis or who has had a gall-bladder operation should have periodic examinations of the urine If a mere trace of sugar is found the blood sugar should be examined If diabetics have abdominal symptoms gall-bladder disease should be suspected Cholecystectomy often has a beneficial effect on the diabetes

Boulin and Kaufmann (10) consider that no diabetic is safe from retinitis despite age, duration of the diabetes, or absence of hypertension, and recommend routine examination of the eyes Once retinitis has set in they believe insulin should be used cautiously Two cases, both of women, aged thirty-three and thirty-five years, respectively, in which the diabetes had been of short duration, are reported Both patients were undernourished, hypertension and signs of vascular sclerosis or renal insufficiency were absent Retinitis developed in spite of insulin treatment

That hyperglycemia without glycosuria is common is pointed out by Davidson (17) who reports that in 204 glucose-tolerance tests made because a study of endocrine imbalance was indicated, hyperglycemia without glycosuria was found in 30 cases, hyperglycemia with glycosuria in 22 cases, and glycosuria with normal blood sugar in 5 cases

Hartmann (27) reports some 250 instances of hypoglycemia in infants and children In only one instance was there reason to believe that there was real pancreatic pathology At operation no tumor was found, but a subtotal pancreatectomy was followed by definite improvement Considerable hypoglycemia is a normal state in newborn infants for the first few days, following which complete adjustment occurs Some children have symptoms of hypoglycemia periodically, especially after missing a meal or when they have infections that cause anorexia or vomiting They become nervous, and are apt to have a convulsion or become unconscious Some of these children are naturally very sensitive to insulin, in the cases of 2 boys the fathers were found to be similarly sensitive

Rathery and Froment (58) believe that urine tests and not blood-sugar studies should be used as a guide in the treatment of most cases, since hyperglycemia is not a measure of the extent of damage to the glucose metabolism They consider estimation of the blood sugar to be variable and unreliable, it is often useless, if not dangerous, to try to bring the blood sugar to normal The urinary sugar output represents far better the adaptation of the organism to its faulty metabolism The study of glycemia is admitted to be necessary at times, such as at the onset of treatment, when the use of insulin is started, in cases of coma and of insulin intolerance or resistance, and in the event of operations Most writers share the opinion that urine tests furnish the best guide to treatment As stated by Peters (51), the blood sugar may usually be assumed to fall to, or below, normal limits at intervals during the twenty-four hours if the urine is sugar-free During the period of adjustment examination of four specimens of urine, before meals and at bedtime, gives valuable information Blood-sugar estimations are of special value in the detection of hypoglycemia and solving of the problems concerned with the regulation of diet and insulin dosage Blood-sugar determinations in the fasting state may not be necessary, blood may be collected at a time most advantageous for the individual case Bugnard, Colombies, and Costes

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Harris and Harris (26) state that in less than two years it is safe to say that protamine insulin has replaced regular insulin in the vast majority of cases treated by physicians experienced in the treatment of diabetes. In many cases however, one or more doses of regular insulin are also required. Experience with about 100 cases has demonstrated many advantages over regular insulin. A high carbohydrate diet (often about 300 gm) and accessory feedings three hours after meals are favored by these authors. Dunlop and Pybus (19) consider that in Scotland the average diabetic needs for maintenance from 115 to 130 gm of carbohydrate daily, in selected cases from 200 to 250 gm are sometimes used.

Warvel and Shafer (77) report on 217 patients receiving protamine insulin and find three groups: (1) those needing both regular and protamine-zinc insulin in the morning and regular insulin later in the day, (2) those requiring both kinds of insulin in the morning, and (3) those controlled by protamine-zinc insulin alone. Over one-half of their patients belonged in the third group. McCullagh (47) remarks that normal fasting blood sugar marks the limit of increase in protamine-zinc-insulin dosage. Since the maximum effect is usually maintained for from twelve to eighteen hours and the whole effect may last over fifty hours, it is seldom necessary to use more than one dose daily. Sixty cases have been treated, the average diet was Ch 182, P 66, F 75. Meyler and deMaar (48) report good results in 40 previously untreated cases. The protamine-insulin effect lasted at least twenty-four hours. In most cases one injection daily sufficed, a few patients needed an additional injection of regular insulin. Laviates (43) states that any prescribed insulin dose can only be a first approximation. With protamine insulin, considered a valuable adjunct to treatment, the maximum tendency to hypoglycemia is during the night or before breakfast. Schwab (66) in France reports favorable results with protamine-zinc insulin and Boulon (9), after comparing the various preparations available, found that protamine-zinc insulin was the most satisfactory. The superiority of protamine insulin over regular insulin after pancreatectomy in dogs and the ability of the former type to control severe clinical diabetes characterized by nocturnal hyperglycemia are reported by Nadler and Isaacs (49). Control of a case previously impossible of satisfactory management with regular insulin has been reported by Gratton (25-a). Introna (32), in Italy, has verified the gradual lowering of the blood sugar and the more prolonged effect of protamine insulin. Borromeo (7), in Italy, has

reported on 12 cases successfully controlled by protamine-zinc insulin. If the blood sugar remains relatively level on an appropriate diet and glycosuria occurs chiefly after meals, morning administration of the insulin is suggested after cutting down the carbohydrate of the first meal. If, however, the blood sugar level is lowest in the morning it is recommended that the insulin be given at night. Neuhoft (50) encountered cases that seemed better controlled by regular insulin, but predicted that such instances would become less frequent as more experience with the new product was gained. Edmondson (20) views protamine insulin as a veritable blessing, especially in difficult cases, but warns that if the use of regular insulin is not understood the new preparation should not be used. Zubiran (86), in Mexico, admits that better control is possible with protamine insulin but believes it cannot be used in all cases, he considers it still in the experimental stage.

Ralli, Fein, and Lovelock (57) have reported that it was impossible to change to protamine insulin successfully in 4 of 20 patients with severe diabetes previously treated from two to seventy-two months with regular insulin, 5 returned to regular insulin because of alternating uncontrolled glycosuria and insulin shock, 8 needed soluble insulin in addition to protamine-zinc insulin. In only 3 was the diabetes controlled by protamine-zinc insulin alone. All of these patients originally received 3 or 4 injections of regular insulin daily, the carbohydrate allowance was from 200 to 250 gm. Jordan (35), reporting results in 60 cases before and after the use of protamine insulin, estimated that benefit resulted in roughly 80 per cent of the cases, but he considered that adherence to treatment is more important than the kind of insulin used.

In diabetic children accustomed to regular insulin a shift to the new preparation produced, on the whole, very disappointing results in the hands of Jackson and Boyd (33). Of 200 children previously treated with insulin with a standard of control which included freedom from any degree of glycosuria throughout the twenty-four hours and avoidance of hypoglycemia 13 were shifted to protamine-zinc insulin. It was found impossible to maintain the former standard of control. The superiority of the new insulin over the old was not established. The use of protamine-zinc insulin was contraindicated unless one had full knowledge of its dangers. It was concluded that the diabetic child who was a candidate for protamine-zinc insulin was the exception rather than the rule. White (78), on the other hand, reported very good

(14) determined the blood sugar immediately before operation directly afterward and subsequently at two-hour intervals and found that elevation is due to the anesthetic used (general local or spinal) to emotional factors and to the gravity of the operation. They conclude that blood sugar curves have a practical application in the prognosis and the prevention of the general intravenous introduction of glucose, adrenalin or pituitrin which are often given in apparent cases of cardiovascular failure when actually, the basis of the syndrome is hyperglycemia. Being antagonistic to insulin, adrenalin and pituitrin are really contraindicated.

PREVENTION

The prevention of obesity and diabetes and the relationship of these two conditions have been discussed by Goodrich (23) who stresses the value of competent periodic health examinations. Glassberg (2) has emphasized the importance of weight reduction and subsequent maintenance of a normal weight in obese diabetics. Five cases are reported in which a diagnosis of cured diabetes seemed possible. The original glucose tolerance curves of diabetic type became normal after substantial reductions in weight. After the tolerance tests became normal the only dietary rule necessary was avoidance of any gain in weight.

MEDICAL TREATMENT

In the light of investigations that indicate a varied mechanism in the production of the diabetic syndrome, evaluation of each case and individualized treatment are essential as stated by Peters. Of importance to the true diabetic who requires insulin and constant adherence to a special diet is the inculcation of the philosophy of the diabetic life (30). In the achievement of this philosophy the character, mental caliber and psychic behavior of the patient are of major importance, his environment and his physician of lesser influence and the character of the disease possibly of least importance.

Graham (24) has surveyed the changes in the treatment of diabetes during the last fifteen years. He is convinced of the value of the new insulin for the great majority of cases. Early reports concerning its use, summarized by Wilder (81) and published in February 1937, were almost unanimously favorable. While one cannot be dogmatic in regard to the treatment of diabetes this is undoubtedly the era of protamine insulin treatment (78).

Practical clinical conclusions concerning protamine insulin were published by Joslin (37) in July 1937. Previously untreated patients rarely

have difficulty with protamine zinc insulin. Because the effect may last for twenty-four hours or longer an additional feeding at bedtime and of course in the middle of the morning and afternoon is necessary. Reactions are to be avoided. They are usually manifested by fatigue, nausea, headache and other typical symptoms of hypoglycemia and are generally more gradual in onset and milder than with regular insulin. In order to avoid reactions which are especially dangerous in elderly individuals it has been necessary to sacrifice the ideal hitherto aimed at in theory but by no means always attained in practice of keeping the urine constantly sugar free. Joslin is satisfied if severe cases are controlled 90 per cent instead of 100 per cent, that is, if the excretion of sugar is not over 10 per cent of the actual carbohydrate in the diet. A patient receiving 150 gm of carbohydrate is accordingly, considered well controlled if only 10 per cent or 15 gm of glucose appears in the urine in twenty-four hours. Local reactions are common at the start of treatment but usually disappear after a few weeks. Supplemental regular insulin must occasionally be used before breakfast. Most juvenile diabetics need regular insulin. In careless or erratic diabetics the use of protamine insulin presents difficulties as stated by Root and Marble (59). For patients previously treated with regular insulin the transfer to the slowly acting preparation may be confusing, patients whose meals are irregular in time and quantity may be poorly controlled or have reactions. If management on regular insulin has been satisfactory there is often little to be gained by transfer. The new preparation has proved of value during operations.

In describing the advantages of protamine zinc insulin in surgery Joslin and his coworkers (39) report that during 1937 operations were performed upon 187 diabetics, all of whom received the new insulin during and after surgery. The operations included 52 amputations, 31 laparotomies, 18 tonsillectomies, 13 thyroidectomies, 6 nephrectomies and 66 miscellaneous procedures. The constant slow action of protamine zinc insulin given in the morning before operation makes the possibility of a reaction during anesthesia unlikely, protects the liver function and makes possible the utilization of large amounts of carbohydrates both before and after operation. The danger of serious hypoglycemia after operation, particularly when glucose has been given intravenously, is decreased by the use of the new insulin. Occasional serious reactions had occurred when regular insulin was used together with glucose solution.

failure, can be recognized in animals before the occurrence of hypoglycemia. It is not due to hypoglycemia nor prevented or cured by glucose. It depends upon the production of pathological hyperinsulinism and is widely independent of the absolute insulin dosage. The insulin dosage that can be tolerated by a strong man without such intoxication is estimated at above 15 units per kgm. of weight.

Humwich and Fazekas (29) report that in non-diabetic patients with infection, resistance is developed against protamine insulin. The effect of the disease in stimulating the endocrine glands and the nervous system results in a rise in the blood sugar, which counteracts the effects of endogenous or injected insulin. Consequently it is suggested that ordinary insulin is preferable to slow-acting protamine insulin in cases of infection. Infection, not fever, is the potent factor since after the injection of insulin, diathermy fever produces little if any change in the blood sugar.

Sakharoff and Rossinsky (60) report from Russia the use of pancreotoxin in 50 cases of diabetes, with a definite therapeutic effect. The serum of an animal, immunized with human pancreas obtained from corpses of persons who had died a sudden death, was injected subcutaneously in amounts of from 0.1 to 0.2 c.c. daily for from fifteen to forty days. Stimulation of the pancreatic activity was believed to occur. Patients were reported to show general improvement, a decrease or even disappearance of the classical symptoms, glycosuria and hyperglycemia, and a higher carbohydrate tolerance.

Pijoan and Zollinger (53), in treating the menopausal syndrome with from 1,200 to 1,600 roentgens of irradiation to the pituitary gland, observed no changes in the carbohydrate metabolism. Since massive irradiation of the pituitary body cannot be directed entirely to the gland itself, but must act as well on neighboring nervous centers, it would be extremely difficult to evaluate any changes that might occur. The employment of roentgen rays in the treatment of diabetes would, therefore, appear to be attended with considerable uncertainty.

DIABETES AND TRAUMA

Injuries are common because of sequelæ and because so many patients are old. The literature on the subject has been reviewed and evaluated by Joslin, Root, and Marble in a chapter of Brahm and Kahn's book, "Trauma and Disease" (11). They conclude that trauma is practically never the primary cause of diabetes. In order to justify any relationship, the time elapsing between an

accident and the onset of diabetes must be very short. Special effort should be made to determine the previous presence or absence of diabetes because the disease is so common and is often latent, mild, or overlooked unless sought. Diabetes in the family and obesity in middle age suggest a predisposition. Glycosuria without hyperglycemia, including renal glycosuria, and harmless levulosuria and pentosuria, must be differentiated. Identification of blood and urine specimens should be assured and reliable methods and technique of examination demanded. Organic injury to the nervous system has not been proved to cause permanent diabetes in experimental animals or, in the opinion of the authors, in clinical cases. Temporary glycosuria, however, often results. Psychic trauma may also produce temporary glycosuria, but it never causes diabetes. It is seldom known to aggravate an existing diabetes.

Ducastaing and Hautefort (18) report a case of complete rupture of the popliteal vein and artery by indirect trauma in a diabetic sixty-five years of age. Susceptibility of the vascular walls to injury is increased by changes due to diabetes. Other cases of similar rupture are cited and surgical measures are discussed.

DIABETES AND PREGNANCY

Lactosuria may be present in the later months of pregnancy and may be confused with diabetes. It is usually ascribed to a lowering of the renal threshold, but, as pointed out by Hurwitz and Irving (31), there may also be associated some impairment of the carbohydrate metabolism. The glucose-tolerance test is usually within normal limits. The presence of lactosuria may be verified by a fermentation test.

Pregnancy may precipitate clinical diabetes in a potential diabetic. Infection, such as syphilis, may further impair liver function or, in some other manner, contribute to the onset of glycosuria, which later may prove to have been an early manifestation of diabetes. Vignes (74) reports the case of a young woman with no glycosuria before pregnancy. Glycosuria appeared in the first pregnancy, which produced a dead fetus. In the second pregnancy glycosuria recurred, coma intervened and was relieved by insulin, at seven months a macerated fetus was delivered. No information is given concerning Wassermann tests, but anti-syphilitic treatment was continued during the entire third pregnancy, which produced an apparently healthy child delivered by cesarean section. Subsequently both mother and child had diabetes.

results when the rigid standard of maintaining the urine constantly sugar free was relaxed somewhat. The end results of treatment as of October 1937 in 604 patients with the onset of diabetes in childhood and who had been adjusted to protamine insulin in the previous two years were reported. As measured by mortality rates and continuance of its use protamine zinc insulin was successful. Five hundred and seventy four patients (95 per cent) were known to be taking protamine zinc insulin alone or in combination with regular insulin only 17 (2.8 per cent) had discontinued the new insulin in favor of the old 4 (0.7 per cent) had died and 17 could not be traced. Control of the diabetic state after use of the new insulin often lasted three times as many hours as after ordinary insulin. The W shaped blood sugar curve and nocturnal hypoglycemia characteristic of juvenile diabetes can be abolished. Acceleration of growth in stature has occurred. Severe reactions are inevitable if the maintenance of constant aglycosuria is attempted. For this reason a standard of control of 90 per cent instead of 100 per cent based upon the twenty four hour urine sugar output has been adopted. The occurrence of postprandial glycosuria and hyperglycemia is less dangerous than nocturnal hyperglycemia as measured by the incidence of acidosis and hepatomegaly. Bettica (5) in Italy in a discussion of diabetes in children adds nothing new and paints a gloomy picture with which we in this country are not familiar in the statement that these patients are inadequate physically and mentally need constant attention and are destined to succumb at the beginning of adolescence.

Jenkinson and Milne (34) report a clinical trial of insulin tannic acid zinc suspension in 9 stabilized diabetic patients and compare the blood sugar levels with those produced by protamine zinc insulin and ordinary insulin. A delayed but prolonged hypoglycemic effect was observed but there was a tendency in some patients toward the production of irritant skin lesions.

Baudouin Lewin and Azerad (4) studied the hypoglycemic limiting dose of insulin that is the smallest amount that injected slowly and continuously into the peripheral vein will abolish hyperglycemia in dogs and in human subjects. In the normal subject the required dose was found to be between 0.01 and 0.02 units per kilo per hour. This was from three to five times weaker than for an anesthetized dog. The normal secretion of insulin under basal conditions is around 0.005 units per kilo per hour. For a man weighing 60 kgm the total pancreatic secretion would be 0.3 units in one hour this represents 0.006 mgm of pure

insulin. In a group of diabetics from 0.2 to 0.3 units per kilo per hour was necessary to bring the blood sugar to normal in three hours. To maintain normal levels patients required 0.01 unit and 0.1 unit respectively. The effects of slow and continued insulin administrations were in all cases an immediate action on the glycemia and glycosuria but acetonuria was not affected until glucose was given intravenously with the insulin when it cleared up very quickly. This method of simultaneous intravenous insulin and glucose injection has given excellent results in a number of cases of severe diabetes and when complications such as infection coma and surgical intervention were present.

Schur and Pappenheim (65) investigating the question of insulin effect have reported additional studies based on the relation of phosphate excretion to the administration of insulin glucose and phosphates. The fact that orally administered phosphates are retained after the use of insulin supports the view that insulin acts as an assimilation hormone on fat and carbohydrate. Hypoglycemic manifestations after insulin are not to be interpreted as a direct result of glucose deficiency of the tissues but as due to substantial changes in the organs concerned. The recurrence of hypoglycemia hours after the effective use of glucose for the original attack indicates that active insulin remains in the organism. Large doses of insulin can produce damage even when neutralized by large amounts of glucose.

In normal unanesthetized rabbits Bridge (13) found that insulin did not affect the total amount of glycogen deposited in the liver and muscles as a result of a constant six hour infusion of glucose. The predominant effect observed was a shift in glycogen deposition from liver to muscle tissue. An appreciation of this action offers a more satisfactory explanation of the mechanism involved in hypoglycemia reactions.

Allen (1) concludes that no animal ever succumbs to insulin hypoglycemia while eating up to the capacity of a normal hungry animal of the species. Anorexia always precedes any dangerous symptoms. Strong or average persons have a high tolerance for insulin in accordance with the prevailing view that insulin is non toxic for them up to an extremely high limit. This however does not imply that similar doses can be safely given to weak or sensitive individuals. Very small amounts of carbohydrate suffice for combating the effect of insulin but the carbohydrate needed must be given over a considerable period. Insulin intoxication characterized by depression malaise weakness anorexia vomiting and circulatory

failure, can be recognized in animals before the occurrence of hypoglycemia. It is not due to hypoglycemia nor prevented or cured by glucose. It depends upon the production of pathological hyperinsulinism and is widely independent of the absolute insulin dosage. The insulin dosage that can be tolerated by a strong man without such intoxication is estimated at above 15 units per kgm of weight.

Himwich and Fazekas (29) report that in non-diabetic patients with infection, resistance is developed against protamine insulin. The effect of the disease in stimulating the endocrine glands and the nervous system results in a rise in the blood sugar, which counteracts the effects of endogenous or injected insulin. Consequently it is suggested that ordinary insulin is preferable to slow-acting protamine insulin in cases of infection. Infection, not fever, is the potent factor since after the injection of insulin, diathermy fever produces little if any change in the blood sugar.

Sakharoff and Rossisky (60) report from Russia the use of pancreotoxin in 50 cases of diabetes, with a definite therapeutic effect. The serum of an animal, immunized with human pancreas obtained from corpses of persons who had died a sudden death, was injected subcutaneously in amounts of from 0.1 to 0.2 cc daily for from fifteen to forty days. Stimulation of the pancreatic activity was believed to occur. Patients were reported to show general improvement, a decrease or even disappearance of the classical symptoms, glycosuria and hyperglycemia, and a higher carbohydrate tolerance.

PiJoan and Zollinger (53), in treating the menopausal syndrome with from 1,200 to 1,600 roentgens of irradiation to the pituitary gland, observed no changes in the carbohydrate metabolism. Since massive irradiation of the pituitary body cannot be directed entirely to the gland itself, but must act as well on neighboring nervous centers, it would be extremely difficult to evaluate any changes that might occur. The employment of roentgen rays in the treatment of diabetes would, therefore, appear to be attended with considerable uncertainty.

DIABETES AND TRAUMA

Injuries are common because of sequelæ and because so many patients are old. The literature on the subject has been reviewed and evaluated by Joslin, Root, and Marble in a chapter of Brahdv and Kahn's book, "Trauma and Disease" (11). They conclude that trauma is practically never the primary cause of diabetes. In order to justify any relationship, the time elapsing between an

accident and the onset of diabetes must be very short. Special effort should be made to determine the previous presence or absence of diabetes because the disease is so common and is often latent, mild, or overlooked unless sought. Diabetes in the family and obesity in middle age suggest a predisposition. Glycosuria without hyperglycemia, including renal glycosuria, and harmless levulosuria and pentosuria, must be differentiated. Identification of blood and urine specimens should be assured and reliable methods and technique of examination demanded. Organic injury to the nervous system has not been proved to cause permanent diabetes in experimental animals or, in the opinion of the authors, in clinical cases. Temporary glycosuria, however, often results. Psychic trauma may also produce temporary glycosuria, but it never causes diabetes. It is seldom known to aggravate an existing diabetes.

Ducastaing and Hautefort (18) report a case of complete rupture of the popliteal vein and artery by indirect trauma in a diabetic sixty-five years of age. Susceptibility of the vascular walls to injury is increased by changes due to diabetes. Other cases of similar rupture are cited and surgical measures are discussed.

DIABETES AND PREGNANCY

Lactosuria may be present in the later months of pregnancy and may be confused with diabetes. It is usually ascribed to a lowering of the renal threshold, but, as pointed out by Hurwitz and Irving (31), there may also be associated some impairment of the carbohydrate metabolism. The glucose-tolerance test is usually within normal limits. The presence of lactosuria may be verified by a fermentation test.

Pregnancy may precipitate clinical diabetes in a potential diabetic. Infection, such as syphilis, may further impair liver function or, in some other manner, contribute to the onset of glycosuria, which later may prove to have been an early manifestation of diabetes. Vignes (74) reports the case of a young woman with no glycosuria before pregnancy. Glycosuria appeared in the first pregnancy, which produced a dead fetus. In the second pregnancy glycosuria recurred, coma intervened and was relieved by insulin, at seven months a macerated fetus was delivered. No information is given concerning Wassermann tests, but anti-syphilitic treatment was continued during the entire third pregnancy, which produced an apparently healthy child delivered by cesarean section. Subsequently both mother and child had diabetes.

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of splanchnic section have promising results been obtained and reports are conflicting. Violet ascribes the benefit observed to the suppression of occasional, sudden discharges of adrenalin. He calls attention to the fact that the operation has not been performed many times and that it is not without danger, but believes that it may prove of value in selected, severe cases with arterial complications. If diabetic symptoms are secondary, as sometimes seems to be the case in patients with gall stones, pancreatic stone, or hyperthyroidism, beneficial results may be expected from surgery aimed at the primary cause. Chabanier, Bréhant, and Donoso (15) report 3 cases of unilateral splanchnicotomy in severe diabetes. A detailed report is presented of 1 patient fifty-eight years of age with diabetes of ten years' duration. The diabetes became progressively more severe. On a diet of Ch 90, P 75, F 140, insulin dosage of 360 units (120-120-120) resulted in from 45 to 60 gm of sugar in the twenty-four-hour-urine specimens. Finally, after resection of the left splanchnic nerves, glycosuria and acetonuria disappeared, a year later a daily insulin dosage of 160 units was required. The improvement was ascribed to the operation.

Sendrail, Cahuzac and Garipuy (67), using normal dogs, attempted to clarify the effects of sympathectomy of the pancreatic arteries on glycogen regulation. Results were controlled by study of the glycemia, of the glycogen regulation, and of the structural changes in the pancreas. The operation causes an initial period of hyperemia of the pancreas with hypoglycemia by means of vasodilation, a second period of hyperglycemia lasting until the twentieth day, apparently due to mechanical irritation, and a third phase of prolonged hypoglycemia associated with the establishment of circulatory equilibrium. Anatomical studies revealed temporary postoperative anemia, a gradually progressive and diffuse hyperemia in the first twenty days, congestion (especially of the islets) about the end of the first month, and then a gradual return to the normal appearance. The results suggest that a persistent increase of the insulin supply is produced. Possible explanations are that capillary dilatation may make secretory function of the pancreas more rapid or efficient, or that the sympathetic nervous system may regulate the gland activity and the sympathectomy directly stimulate insulin formation.

Piaggio-Blanco and Sayagués (52), after reviewing pertinent literature on the influence of the thyroid on carbohydrate metabolism and on the effect of ablation in pancreatic diabetes, and carefully analyzing studies on one of their patients,

conclude that removal of a normal thyroid gland has no appreciable influence on the course of human diabetes. The transitory postoperative hypoglycemia reported during brief studies may have been caused by surgical trauma, postoperative fasting, or parathyroid insufficiency.

Mastrosimone (46) has reported the results of artificially produced parotid swelling on experimental pancreatic diabetes. Fifteen dogs were used. Injections of 2 cc of alcohol-iodine solution containing from 10 to 15 drops of benzene were made through the ducts and directly into the exposed parotid glands, after which the ducts were closed for twenty-four hours by a silk ligature. Swelling usually appeared within from six to forty-eight hours and lasted for from twenty to sixty days. No atrophy resulted, the chief residual change was hypertrophy of the glandular connective tissue. Pancreatectomy was done, in some instances before and in others from three to ten days after the onset of parotid tumefaction. In all of the animals an influence of the parotid glands on the diabetes was demonstrated. The lowest amounts of blood sugar were found when the pancreas was removed after the onset of parotid swelling, some dogs lived for more than four months on ordinary diets. The greatest amounts of blood sugar were found when Stenson's ducts were merely ligated and no injections were made into the glands.

SURGERY IN THE PRESENCE OF DIABETES

Although some writers, as Gratton (25-b), simply state that the risk of operation is slight under present-day management with insulin, most authors stress the fact that the presence of diabetes constitutes a definite, added danger. It is generally agreed that treatment of the diabetes should be individualized under medical supervision, that pre-operative and postoperative care are of vital importance, and that unless an emergency exists two or three weeks spent in preparation for surgery is advisable.

Priestly (56) points out that, properly managed, the surgical diabetic never dies from coma, but frequently from infection. If the surgical condition is not a complication of the diabetes the risk of operation appears only slightly greater than in the non-diabetic. In 17 cases of major surgery in diabetics there were 3 deaths, whereas in 13 surgical procedures for diabetic conditions there were 5.

Lindsay and his coworkers (44) consider that the chances of a successful outcome are directly proportional to the amount of pre-operative and postoperative medical care given. They report a

Management of the diabetes requires the most efficient medical care. Obstetricians should not handle these cases alone. Treatment must be individualized and a frequent check made of the patient's condition. Under proper management the mother may expect to go safely through pregnancy and labor. The outlook for the fetus, however, is much poorer than in non-diabetics. Most writers believe that the nearest approach to normal delivery is desirable but some advise cesarean section for the average case.

White (79) in an analysis of 271 pregnancies in 191 diabetic patients of Jo lin found a surprising improvement in the results following the use of insulin as compared with the outcome in the pre-insulin era. The incidence of spontaneous abortion has been reduced by more accurate control of the diabetes. Giant fetuses are common. Numerous pregnancies are discouraged because of the morbidity hazard and more important because of the potentiality of inheritance of the disease. Hurwitz and Irving (31) report that among 51 diabetics delivered at the Boston Lying in Hospital since 1916 the only fatality occurred in a woman who had severe eclampsia. A sudden decrease in tolerance is common in the middle trimester and requires additional insulin. Between 1916 and 1932 34 diabetic pregnancies produced 35 infants with a gross fetal mortality of 42.8 per cent. Since 1932 there was a gross fetal mortality of only 16.7 per cent in 28 diabetic pregnancies. The excessive size of the fetus and the increased frequency of fetal anomalies were less important factors than neglect of the diabetes. Cesarean section should be reserved for patients whose infants exceed the normal weight or for patients that present some other clear obstetrical indication. Titus (72) has reported 43 cases. Of the 16 patients treated in the last two years not a mother was lost but 9 babies died in pregnancies of seven or more months duration. Individualization of the method of delivery is urged but when the baby seems quite big enough cesarean section is suggested as the safest method of avoiding intra uterine death. Herrick and Tillman (28) in reporting on 56 patients with diabetes comment on the high incidence of vascular disease and hyperthyroidism and on the liability to toxemia. The fetus may be either underweight or overweight. Routine cesarean section is considered unwise. Brandstrup and Okkel (12) report in 10 cases of pregnancy in 19 diabetics observed in the Rigshospital of Copenhagen. Precomatose conditions or coma appeared in 6 patients and hypoglycemia was observed in 13 patients usually in connection with hyperemesis and a lowered

state of nutrition. The insulin requirement decreased in 6 increased in 4 and remained unchanged in 8 patients no insulin was given to 4 patients. No clinical evidence was found of any permanent change in the severity of the maternal diabetes as the result of the pregnancy. The obstetrical risk is somewhat increased by a tendency toward hydramnios excessive size of the child and especially infection when eczema of the vulva is present. Only 10 of 23 children were discharged from the hospital living. Six were still born with third degree maceration 2 were excessively large and died during delivery 5 died in the first days after birth. Two of the last group were premature. In no case was hypoglycemia proved as a cause of death. The high infant mortality may probably be attributed to maternal hyperglycemia and acidosis. In 3 instances changes observed at necropsy in the pancreas hypophysis and thyroid are described. It is hoped that the use of new insulin which makes possible the avoidance of great variations in the blood sugar concentration will improve the prognosis for the diabetic mother and especially for her child.

SURGICAL TREATMENT OF DIABETES

Surgical procedures proposed for treatment and reported in experiments on animals and in man have been reviewed and evaluated by Violet (75). He considers diabetes a disease of the regulatory mechanism of the carbohydrate metabolism and differentiates essential diabetes from symptomatic diabetes due to lesions of the pancreas the suprarenal thyroid or parathyroid glands the hypophysis or the third ventricle. In essential diabetes lesions of the pancreas are rare and the insulin content is normal. Attention is called to the fact that a depancreatized dog is not comparable to a human diabetic this explains the conflicting results between animal and human experimentation. The possibility of surgical treatment in diabetes is based on a physiological classification of the endocrine glands as being hyperglycemic or hypoglycemic and on our knowledge of the nervous regulation of the carbohydrate metabolism. In the attempt to cause an increased secretion of insulin efforts have been made to activate the pancreas and the salivary glands to perform a sympathectomy of the pancreatic arteries and to make pancreatic grafts. As far as their clinical application is concerned these attempts have met with almost complete failure. In the effort to depress hyperglycemic factors attack has centered on the suprarenal and thyroid glands. Only in the case

many advantages), and (3) measures immediately preceding operation that will insure optimal glycogen reserve in the liver and protection against dehydration and acidosis. The absence of ketosis prior to operation is clearly desirable and almost always possible to attain. It is advantageous but not essential that the urine be free from sugar, especially in elderly, arteriosclerotic individuals in whom hypoglycemia is more dangerous than slight glycosuria. That blood-sugar levels be normal prior to operation is theoretically desirable, but often difficult or even impossible of attainment, and is relatively unimportant if the twenty-four-hour excretion of glucose in the urine is small. Ketosis and hyperglycemia may be symptoms of inflammation and suppuration as well as of the severity of the diabetes. It is held by many writers, and clinically appears to be true, that normal glycemia favors healing without infection.

The diet before operation should be individualized. The exact type, as regards carbohydrate content, is unimportant provided its composition is known and utilization is insured by adequate amounts of insulin. Standard (69) mentions using Ch from 180 to 250, P from 70 to 80, and F from 75 to 85 gm with sufficient insulin before meals to keep the urine sugar-free. Smith (68) gave a balanced diet of Ch 100, P 50, F 60, and Landesman (42) usually prescribed Ch 100, P $\frac{1}{2}$ gm per kgm of body weight, and F 60, as a routine preliminary diet. Standard gave the average patient an infusion of 1,000 c cm of physiological salt solution with 50 gm of dextrose two hours before operation and again after operation. For minor procedures 300 c cm of orange juice were given by mouth an hour and a half before operation. Stoerring (70) employed a more elaborate regimen of glucose and insulin administration, especially in major abdominal operations, in the belief that systematic "over-insulinization" favors wound healing. In acute surgical conditions Stoerring gives from 20 to 40 units of insulin shortly before operation and from 80 to 100 c cm of 25 per cent glucose 15 minutes later. Following operation glucose is usually given subcutaneously or intravenously, and small, liquid feedings are begun as soon as possible.

Peripheral circulatory collapse, contributed to by dehydration, hyperventilation, and cooling, is to be guarded against. As stated by Wills and Gray (84), the blood pressure is an excellent and simple clinical guide to the presence or absence of medical shock and should be recorded at frequent intervals in all cases. "Dehydration should be combatted by large volumes of fluids, preferably

saline, which can be given intravenously to restore the depleted mineral base, whole blood or acacia solutions may be preferable in emergencies. Hyperventilation will disappear as the alkaline reserve is raised, and cooling can be combatted by the external application of heat." When food is tolerated by mouth, feedings containing from 20 to 50 gm of carbohydrate may be given at intervals of four hours. Insulin is adjusted after operation on the basis of urine tests, being given before each feeding in amounts varying with the sugar content of the urine. Usually, in from four to six days the original diet, divided into four or five feedings, may be allowed in semi-solid form. In from eight to ten days the original diet may ordinarily be resumed.

The choice of anesthetic should be individualized. Among general anesthetics, nitrous oxide and ethylene are usually preferred, cyclopropane has been favored, and ether disapproved except for narcosis of short duration. Wills and Gray (84) state that procaine preparations, whether used intraspinally or for local infiltration, apparently have no deleterious effect on the carbohydrate metabolism. Nitrous oxide and ethylene produce only slight changes if the anesthesia is not prolonged. Nitrous oxide with ether produces more marked changes, but may be used if steps are taken to counteract the ensuing acidosis. Nitrous oxide and oxygen are unsatisfactory for most abdominal operations because they give poor relaxation. For operations on the lower extremities, perineum, and lower abdomen Wills prefers spinal anesthesia. Schoenbauer (64) recommends ether inhalation for operations of short duration, or evipan narcosis. From a study of 40 consecutive, non-diabetic cases in which the blood sugar was closely followed through the period of ether anesthesia and for some time afterward, Pratt (55) concludes that in non-diabetic patients, whatever the characteristic effect of ether on the blood-sugar level, it is subject to numerous, individual variations, a primary glucose mobilization, apparently due to adrenalin, may or may not be followed, according to the depth of anesthesia, by a secondary and probably more profound interference with the normal course of sugar utilization, that this effect is produced by anesthetics other than ether, and that the rise of the blood sugar seems to be a welcome physiological compensatory phenomenon.

THE TREATMENT OF SURGICAL COMPLICATIONS OF DIABETES

Of the complications of diabetes, localized infections, especially carbuncle, which is the most

reduction in mortality from 25 per cent (in 29 operations from 1924 to 1929) to 10.5 per cent (in 57 operations from 1930 to 1936) as a result of better medical management.

Standard Brandeone and Rall (69) report a mortality rate of only 6.9 per cent in 172 patients who had received excellent care and observation in various special clinics as compared with 20.8 per cent in a poorly controlled group of 302 patients. In cases of major amputation a mortality rate of 16 per cent in adequately treated cases presented a striking contrast to a mortality rate of 49 per cent in a poorly managed group.

Wills and Gray (84) insist that the surgical diabetic is primarily a medical problem, close co-operation between a diabetic-minded surgeon and an internist is necessary. A thorough understanding of acidosis and peripheral circulatory collapse is essential. The choice of anesthetic should be individualized. Under such favorable conditions diabetes in the surgical patient should not greatly influence the operative risk.

Stoerring (70) also stresses the need of the closest co-operation between the surgeon and internist. In addition to the objectives of avoidance of acidosis and increase of the sugar tolerance, he favors the principle of over-insulinization. Schoenbauer and Dibold (64) point out the possible danger of insulin shock to diseased blood vessels and emphasize the fact that in gangrene of the extremities the decisive factor is the degree of severity of vascular change and not the severity of the diabetes. Landsman (42) compares the preparation of the non-emergency diabetic case with that of the emergency surgical diabetic. In the former observation for at least two or three weeks is desirable and treatment should be individualized.

Smith (68) calls attention to the fact that the usual statement that a controlled diabetic can be operated upon the same as a non-diabetic individual is not wholly true. Controlled diabetics are postoperatively more prone to wound infections in clean contaminated cases. Pneumonia is more prevalent following upper abdominal operations. Trivial wound infections are more apt to go on to the more serious ones with fascial sloughs, disruptions with and without evisceration and hernia formation necessitating subsequent operative repair. They do not stand multiple anesthetics or operations as well as non-diabetics. Diabetes is a desperately severe complication in any case of carcinoma. The mortality of cancer surgery in uncontrolled or uncontrollable diabetics is so prohibitive that only palliative procedures should be undertaken upon them.

Since premature and relatively severe arteriosclerosis may be expected in most chronic diabetics of middle age, accurate evaluation of the cardiovascular and renal status is necessary prior to any elective operation and is advisable before any surgical procedure.

Charbonnier and Schauenberg (16) report the case of a sixty-one year old woman with diabetes and carcinoma of the rectum. After sixteen days of preparation a laparotomy was performed and the wall of the small intestine was accidentally cut. The cut was sutured and no complication was anticipated. However, a fecal fistula formed. The second operation was performed three weeks later. Both the abdominal and the anal incision gradually opened without signs of suppuration after six weeks. Death occurred two months after the first operation. The authors are convinced that from the surgical viewpoint a diabetic cannot be considered a normal subject and that it is particularly unwise to operate upon a patient with cancer. No mention is made as to whether a prolonged period of dietary deficiency had preceded hospitalization and no information was obtained regarding the Vitamin C content of the blood, a deficiency of which may have been a factor in the failure of the incisions to heal.

Of special importance in diagnosis is treatment is the fact that diabetic acidosis may simulate a surgical abdomen producing nausea, vomiting, localized rigidity, fever, leucocytosis and occasionally pyuria and hematuria. This phenomenon described by Wills and Gray (84) is ascribed by them to a deficiency of sodium chloride. Stoerring (70) believes that toxic irritation of the celiac plexus is responsible. The fact that acute appendicitis in a diabetic may present unusually mild symptoms add to the difficulty of diagnosis. Bothe and Beardwood (8) report that 74 per cent of 136 patients with diabetic acidosis presented abdominal symptoms such as pain, nausea and vomiting and usually fever and leucocytosis. Before operation upon any diabetic because of abdominal symptoms, acidosis should be ruled out. When abdominal disease is actually present the symptoms are apt to be less severe than the pathological changes would lead one to expect.

Preparation for surgery in elective cases demands (1) an adequate supply of proteins, vitamins and mineral, depletion of which may have occurred in long-standing uncontrolled diabetes, especially in patients of poor economic status; (2) control of the diabetic state by means of insulin and appropriate diet (in previously untreated cases the new insulin appears to offer

many advantages), and (3) measures immediately preceding operation that will insure optimal glycogen reserve in the liver and protection against dehydration and acidosis. The absence of ketosis prior to operation is clearly desirable and almost always possible to attain. It is advantageous but not essential that the urine be free from sugar, especially in elderly, arteriosclerotic individuals in whom hypoglycemia is more dangerous than slight glycosuria. That blood-sugar levels be normal prior to operation is theoretically desirable, but often difficult or even impossible of attainment, and is relatively unimportant if the twenty-four-hour excretion of glucose in the urine is small. Ketosis and hyperglycemia may be symptoms of inflammation and suppuration as well as of the severity of the diabetes. It is held by many writers, and clinically appears to be true, that normal glycemia favors healing without infection.

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THE TREATMENT OF SURGICAL COMPLICATIONS OF DIABETES

Of the complications of diabetes, localized infections, especially carbuncle, which is the most

reduction in mortality from 25 per cent (in 28 operations from 1924 to 1929) to 10.5 per cent (in 57 operations from 1930 to 1936) as a result of better medical management.

Standard Brandeone and Ralli (69) report a mortality rate of only 6.9 per cent in 172 patients who had received excellent care and observation in various special clinics as compared with 20.8 per cent in a poorly controlled group of 302 patients. In cases of major amputation a mortality rate of 16 per cent in adequately treated cases presented a striking contrast to a mortality rate of 49 per cent in a poorly managed group.

Wills and Gray (84) insist that the surgical diabetic is primarily a medical problem; close co-operation between a diabetic-minded surgeon and an internist is necessary. A thorough understanding of acidosis and peripheral circulatory collapse is essential. The choice of anesthetic should be individualized. Under such favorable conditions diabetes in the surgical patient should not greatly influence the operative risk.

Stoerring (70) also stresses the need of the closest co-operation between the surgeon and internist. In addition to the objectives of avoidance of acidosis and increase of the sugar tolerance he favors the principle of overinsulinization. Schoenbauer and Dibold (64) point out the possible danger of insulin shock to diseased blood vessels and emphasize the fact that in gangrene of the extremities the decisive factor is the degree of severity of vascular change and not the severity of the diabetes. Landesman (42) compares the preparation of the non-emergency diabetic case with that of the emergency surgical diabetic. In the former observation for at least two or three weeks is desirable and treatment should be individualized.

Smith (68) calls attention to the fact that the usual statement that a controlled diabetic can be operated upon the same as a non-diabetic individual is not wholly true. Controlled diabetics are postoperatively more prone to wound infections in clean contaminated cases. Pneumonia is more prevalent following upper abdominal operations. Trivial wound infections are more apt to go on to the more serious ones with fascial sloughs, disruptions with and without evisceration and hernia formation necessitating subsequent operative repair. They do not stand multiple anesthetics or operations as well as non-diabetics. Diabetes is a desperately severe complication in any case of carcinoma. The mortality of cancer surgery in uncontrolled or uncontrollable diabetics is so prohibitive that only palliative procedures should be undertaken upon them.

Since premature and relatively severe arteriosclerosis may be expected in most chronic diabetics of middle age, accurate evaluation of the cardiovascular and renal status is necessary prior to any elective operation and is advisable before any surgical procedure.

Charbonnier and Schauenberg (16) report the case of a sixty-one year old woman with diabetes and carcinoma of the rectum. After sixteen days of preparation a laparotomy was performed and the wall of the small intestine was accidentally cut. The cut was sutured and no complication was anticipated. However a fecal fistula formed. The second operation was performed three weeks later. Both the abdominal and the anal incision gradually opened without signs of suppuration after six weeks. Death occurred two months after the first operation. The authors are convinced that from the surgical viewpoint a diabetic can not be considered a normal subject and that it is particularly unwise to operate upon a patient with cancer. No mention is made as to whether a prolonged period of dietary deficiency had preceded hospitalization and no information was obtained regarding the Vitamin C content of the blood, a deficiency of which may have been a factor in the failure of the incisions to heal.

Of special importance in diagnosis and treatment is the fact that diabetic acidosis may simulate a surgical abdomen producing nausea, vomiting, localized rigidity, fever, leucocytosis and occasionally pyuria and hematuria. This phenomenon described by Wills and Gray (84) is ascribed by them to a deficiency of sodium chloride. Stoerring (70) believes that toxic irritation of the celiac plexus is responsible. The fact that acute appendicitis in a diabetic may present unusually mild symptoms adds to the difficulty of diagnosis. Bothe and Beardwood (8) report that 74 per cent of 136 patients with diabetic acidosis presented abdominal symptoms such as pain, nausea and vomiting and usually fever and leucocytosis. Before operation upon any diabetic because of abdominal symptoms acidosis should be ruled out. When abdominal disease is actually present the symptoms are apt to be less severe than the pathological changes would lead one to expect.

Preparation for surgery in elective cases demands (1) an adequate supply of proteins, vitamins and minerals, depletion of which may have occurred in long standing uncontrolled diabetes especially in patients of poor economic status; (2) control of the diabetic state by means of insulin and appropriate diet (in previously untreated cases the new insulin appears to offer

many advantages), and (3) measures immediately preceding operation that will insure optimal glycogen reserve in the liver and protection against dehydration and acidosis. The absence of ketosis prior to operation is clearly desirable and almost always possible to attain. It is advantageous but not essential that the urine be free from sugar, especially in elderly, arteriosclerotic individuals in whom hypoglycemia is more dangerous than slight glycosuria. That blood-sugar levels be normal prior to operation is theoretically desirable, but often difficult or even impossible of attainment, and is relatively unimportant if the twenty-four-hour excretion of glucose in the urine is small. Ketosis and hyperglycemia may be symptoms of inflammation and suppuration as well as of the severity of the diabetes. It is held by many writers, and clinically appears to be true, that normal glycemia favors healing without infection.

The diet before operation should be individualized. The exact type, as regards carbohydrate content, is unimportant provided its composition is known and utilization is insured by adequate amounts of insulin. Standard (69) mentions using Ch from 180 to 250, P from 70 to 80, and F from 75 to 85 gm with sufficient insulin before meals to keep the urine sugar-free. Smith (68) gave a balanced diet of Ch 100, P 50, F 60, and Landesman (42) usually prescribed Ch 100, P $\frac{1}{2}$ gm per kgm of body weight, and F 60, as a routine preliminary diet. Standard gave the average patient an infusion of 1,000 c cm of physiological salt solution with 50 gm of dextrose two hours before operation and again after operation. For minor procedures 300 c cm of orange juice were given by mouth an hour and a half before operation. Stoerring (70) employed a more elaborate regimen of glucose and insulin administration, especially in major abdominal operations, in the belief that systematic "over-insulinization" favors wound healing. In acute surgical conditions Stoerring gives from 20 to 40 units of insulin shortly before operation and from 80 to 100 c cm of 25 per cent glucose 15 minutes later. Following operation glucose is usually given subcutaneously or intravenously, and small, liquid feedings are begun as soon as possible.

Peripheral circulatory collapse, contributed to by dehydration, hyperventilation, and cooling, is to be guarded against. As stated by Wills and Gray (84), the blood pressure is an excellent and simple clinical guide to the presence or absence of medical shock and should be recorded at frequent intervals in all cases. "Dehydration should be combatted by large volumes of fluids, preferably

saline, which can be given intravenously to restore the depleted mineral base, whole blood or acacia solutions may be preferable in emergencies. Hyperventilation will disappear as the alkaline reserve is raised, and cooling can be combatted by the external application of heat." When food is tolerated by mouth, feedings containing from 20 to 50 gm of carbohydrate may be given at intervals of four hours. Insulin is adjusted after operation on the basis of urine tests, being given before each feeding in amounts varying with the sugar content of the urine. Usually, in from four to six days the original diet, divided into four or five feedings, may be allowed in semi-solid form. In from eight to ten days the original diet may ordinarily be resumed.

The choice of anesthetic should be individualized. Among general anesthetics, nitrous oxide and ethylene are usually preferred, cyclopropane has been favored, and ether disapproved except for narcosis of short duration. Wills and Gray (84) state that procaine preparations, whether used intraspinally or for local infiltration, apparently have no deleterious effect on the carbohydrate metabolism. Nitrous oxide and ethylene produce only slight changes if the anesthesia is not prolonged. Nitrous oxide with ether produces more marked changes, but may be used if steps are taken to counteract the ensuing acidosis. Nitrous oxide and oxygen are unsatisfactory for most abdominal operations because they give poor relaxation. For operations on the lower extremities, perineum, and lower abdomen Wills prefers spinal anesthesia. Schoenbauer (64) recommends ether inhalation for operations of short duration, or evipan narcosis. From a study of 40 consecutive, non-diabetic cases in which the blood sugar was closely followed through the period of ether anesthesia and for some time afterward, Pratt (55) concludes that in non-diabetic patients, whatever the characteristic effect of ether on the blood-sugar level, it is subject to numerous, individual variations, a primary glucose mobilization, apparently due to adrenalin, may or may not be followed, according to the depth of anesthesia, by a secondary and probably more profound interference with the normal course of sugar utilization, that this effect is produced by anesthetics other than ether, and that the rise of the blood sugar seems to be a welcome physiological compensatory phenomenon.

THE TREATMENT OF SURGICAL COMPLICATIONS OF DIABETES

Of the complications of diabetes, localized infections, especially carbuncle, which is the most

dangerous surgical complication and gangrene of the extremities which is the most frequent serious surgical accident have received the greatest attention

In a series of 45 carbuncles Standard Brande and Rall (69) reported no deaths among 9 patients who were under careful medical management and 7 deaths among 36 patients under inadequate supervision. Smith (68) favors conservative treatment for carbuncle on the back of the neck rarely practices crucial incision or excision and prefers to secure drainage by chemical carbolic acid or potassium hydroxide or by multiple cautery punctures using nitrous oxide or a small dose of avertin for anaesthesia. Carbuncles elsewhere than on the face or neck he believes may be incised or excised. Urbach (73) has reported an interesting case of phagedenic ulcer of the skin on the basis of skin diabetes. Without a history or signs of injury a skin lesion on the chest went through the stages of furuncle, eczema, pruritus and sweat gland abscess, the ulceration reached the size of a saucer and resisted treatment. Classical symptoms of diabetes were absent, the urine was sugar free and the fasting blood sugar level was normal. A glucose tolerance test revealed a diabetic curve and that the fasting sugar content of the skin was high. Insulin and carbohydrate restriction effected a cure. In cases of hospital gangrene a similar cause should be ruled out. San Miguel (63) described a case of gaseous gangrene of the penis in a diabetic that was rapidly fatal after eight days of previous neglect.

Gangrene particularly of the lower extremities is the most common serious surgical complication. Its increased frequency is due to the fact that the life expectancy of diabetics has increased. Gangrene stands next to coma as a preventable cause of death. Samuels (61) warn that arteriosclerosis obliterans plus diabetes is a serious condition requiring intensive treatment as soon as the diagnosis is made. The prevention of gangrene is possible if the diagnosis of deficient circulation is made in its incipient stages and proper treatment is instituted at once. Warthen (76) emphasizes the importance of care in hygiene of the feet on the part of every diabetic and suggests that a printed list containing simple rules outlined years ago by McKittick and Root be given to each diabetic patient. Unnecessary amputations or premature death may result from neglect of apparently trivial injuries or lesions of the feet. Because of its wide prevalence and frequent recurrences ringworm of the feet is a particular danger. Kelly (40) points out that

inasmuch as the epidermophyton fungus primarily invades the tissues and thereby opens an avenue for secondary infection a thorough understanding is essential of its sources, repeated possibilities of exposure, characteristic clinical lesions, histopathology and associated allergic manifestations in order to prevent gangrene in diabetic patients. Fonseca's vaccine is reported to have been of material aid in the successful management of 30 cases of dermatophytosis in diabetics.

Conservative treatment of gangrene is often successful according to Samuels (61) provided meticulous care is given to the local condition with due regard for sepsis and antisepsis. Complete rest is imperative at the first sign of impending gangrene. It is advisable to prohibit the use of alcohol in all forms. The object of local treatment is to prevent if possible the development of secondary infection in the gangrenous area. Every precaution and care should be taken in dressing and handling the involved parts. If there is considerable infection wet dressings are preferable. The natural heat of the entire extremity can be readily preserved by wrapping the entire limb in a soft warmth retaining covering such as cotton or lamb's wool. Intravenous injections of hypertonic saline solution (1 or 3 per cent) cause an immediate increase in the peripheral pulse amplitude and stimulate the collateral circulation. If there are no contraindications such as serious myocardial damage, nephritis or hypertension saline injections may be given three times a week in amounts of from 200 to 300 ccm. Sandstead and Beams (62) have reported observations before and after the oral administration of sodium chloride on 13 diabetic patients with pain of neuritic origin in 10 and of arteriosclerotic origin in 3. Daily from 0.5 to 0.5 gm per kg body weight of sodium chloride in solution was sipped over a period of half an hour three or four times during the day. All of the patients obtained complete or marked relief of the neuritic symptoms. Those with arteriosclerotic pain showed signs of improvement of the vascular disease in those with neuritic pain the cutaneous test described by de Takats showed improvement of the circulation. The results obtained suggest that ischemia due to primary arteriosclerosis is responsible for the neuritic symptoms.

The indications for radical amputation are mainly according to Samuels (61) uncontrollable spread of the gangrene to the extent of destruction of the weight bearing part of the foot and spreading infection that cannot be controlled by incision and drainage or other surgical measures. White (80) recommend that a diabetic team take

charge of the patient, the medical member to conduct a general study and to bring the diabetes under control, while the surgeon investigates the circulation of the extremity. The presence or absence of arterial pulsation in the dorsalis pedis, posterior tibial, popliteal, and femoral arteries is noted, the oscillogram and, finally, the McClure-Aldrich test are used. A thermostat skin study may be of some value. If the circulatory tests indicate that the advanced arterial disease is well localized in a gangrenous toe, local amputation at the metatarsophalangeal joint may be considered. Although sometimes successful, simple amputation of the toe is more often insufficient. Williams and O'Kane (83) report a five-year study of 496 cases of surgical diabetes. Following an arrangement whereby every patient was treated by the same surgeon in co-operation with an internist, the mortality rate fell from 50 to 20 per cent. In severely infected lesions of the extremity thigh amputation is preferred. Careful asepsis is important and includes scrubbing of the skin with water, soap, and alcohol forty-eight hours before operation, wrapping of the extremity in sterile towels, and a repetition of the scrubbing after twenty-four hours. By means of such aseptic precautions, together with most careful tissue-sparing surgical technique and postoperative care by the internist, most favorable results can be anticipated.

In deciding upon the site of amputation the surgeon must consider the pathological process, the level of effective collateral circulation, and the prosthetic requirements. The latter are, however, of subordinate importance. White (80) advises amputation from the middle of the leg upward whenever any procedure more radical than toe amputation is necessary. If the circulation is sufficient the middle third of the leg is the site of election, if amputation through or above the knee is indicated the lower third of the femur is selected. Drainage of the wound is carried out. Wills (84) favors amputation through the mid-thigh but, in selected cases, uses the Callander modification of the Stokes-Gritti operation which neither exposes nor injures the muscle bellies. In infected cases showing advanced lymphangitis, a guillotine amputation above or below the knee may be a definitely life-saving procedure. The patient's ability to walk later should not be given too much consideration if the life expectancy is short and if a subsequent, higher amputation might become necessary. Drainage has not recently been employed by Wills. Samuels (61) considers simple, circular amputation through the lower third of the thigh with tight closure of the

stump and no drainage as the procedure of choice. Smith (68) favors a modified guillotine technique of an amputation through the lower third of the leg. Twenty-two amputations through the leg for diabetes between 1930 and 1937 resulted in a mortality of 18.1 per cent. In contrast, 50 amputations, most of them through the thigh, between 1916 and 1927, showed a mortality of 45 per cent.

In amputations for gangrene the use of a tourniquet and local anesthetics is contraindicated. Smith prefers nitrous oxide and Wills spinal anesthesia. The average, well treated diabetic needs no special preparation for operation. The presence of infection increases the insulin requirement. It is not necessary for the blood sugar to be normal or the urine sugar-free. Neglected or dehydrated patients require appropriate measures. Following operation frequent urine tests furnish a guide as to insulin dosage.

Arnell (3) has reported 117 cases of diabetic gangrene treated during the period from 1910 to 1934 in the Maria Hospital in Stockholm. Forty-five of the patients were females and 72 males. During the last ten-year period there was a definite increase in number, ascribed to the increased longevity of diabetics. In 28 per cent healing ensued after expectant treatment, in 22 per cent after minor operations, such as incisions and toe amputations. It is concluded, therefore, that treatment should, as far as possible, be conservative. Gangrene with infections, chills and fever, and troublesome ache in the gangrenous, pulseless foot are indications for major amputation. As a major amputation that of the thigh is recommended as amputations below the knee rarely result in healing by first intention. The mortality for all cases was 27.4 per cent and after major amputation 38 per cent. The most common causes of death were cardio-arteriosclerosis, sepsis, lung embolism, and bronchopneumonia, in the order mentioned. The primary operative mortality was not particularly high. Žucha (87) has reported a statistical study of 100 cases of diabetic gangrene. The average age of the patients was sixty-two years. The mortality was 32 per cent, with septicemia the most common cause of death. It was anticipated that more complete and rapid preparation for operation would lower the mortality rate.

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SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Robins, C R Direct Inguinal Hernia *Ann Surg*, 1938, 108 389

Robins reviews the development of the technique for repair of inguinal hernia from the year 1884, when Bassini devised his operation, up to the present time. Bassini stated that the principle of his operation was to reconstruct the inguinal canal after the manner of its physiological formation. A canal with an abdominal and subcutaneous opening and two walls is provided. Under the influence of abdominal pressure the posterior wall is pressed against the anterior wall, and both support each other to withstand continuous and strong impulses. Prominent among surgeons who have modified or developed new methods for the repair of inguinal hernia are Halstead, Ferguson, McArthur, and Andrews.

Modifications have always been directed toward the prevention of recurrences. Robins believes that the chief reason for recurrence is the absence of a well formed conjoint tendon and an attenuation of the muscles that form it. The object of his article is to point out the difficulties encountered in effecting a cure of direct hernia, and to present an operative procedure by which he has been able to effect cures in 100 per cent of 27 operations. As is well known, most recurrences occur in the lower angle and, as Robins points out, dissection will show that the conjoint tendon is absent at the pubic end of the inguinal canal, and that the internal oblique and transversalis muscles pass over directly to the rectus sheath and leave a defect from the lower border of the internal oblique muscle to the pubic bone. Attempts to close this defect by the ordinary methods of suture are not uniformly successful. Overlapping of the external oblique fascia is not successful because the pillars of the ring at this point are fixed by their insertion into the pubes. Sutures applied under tension are either cut out or absorbed.

The use of fascial sutures was first reported by McArthur in 1901. Gallie and Le Mesurier did much to develop the use of fascial sutures. They preferred to use fascia transplanted from the thigh, which procedure, Robins believes, complicates the operation unnecessarily. The steps in the operative procedure which the author recommends are as follows:

- 1 Incision is made down to the aponeurosis of the external oblique muscle in the direction of its fibers, and sufficient dissection is done to give wide exposure of the aponeurosis.

- 2 The external spermatic fascia is dissected from the border of the external ring and the inguinal canal is opened by incising the aponeurosis from the external ring to the belly of the external oblique.

- 3 If a sac is present, it is removed.

- 4 Fascial sutures are secured from the medial and lateral flaps of the external oblique aponeurosis.

Care must be taken to preserve the strong attachment of this fascia to the pubes.

- 5 Suturing with the medial strip is done first. The fascial suture is passed first through the sheath of the rectus muscle, then over the cord, and through the fascia covering the pubic bone. The fascial stitch is then continued upward to suture the internal oblique muscle and transversalis fascia to Poupart's ligament.

- 6 The second fascial suture derived from the lateral flap is used to suture the lateral margin of the external oblique fascia to the opposite leaf of fascia.

This operation protects the external ring even more efficiently than normal insertion of the conjoint tendon.

Robins includes a detailed report of the cases of 23 patients with 27 operations, as 4 patients had double hernias. These cases have been observed over a period of from five months to four years, and no recurrences have been found. EARL GARSIDE, M D

Kross, I An Experimental Investigation of Evisceration *Am J Surg*, 1938, 41 462

The author made a clinical study of postoperative evisceration in which the various theories of the mechanism of its production were presented and analyzed. As a result of his findings, the following conclusions were made: "no one single factor by itself is solely responsible for all cases of evisceration."

This condition is one brought on by a combination of events, in which any single one may by itself be insufficient, but which, combined with others, may produce wound rupture. The results of the experiments of Freeman, King, and the author, and the frequent findings of a partial wound rupture with healing of the rest of the wound, justify the assumption that, in all probability, the one most important factor is a defect in the closure of the peritoneum."

To test this hypothesis the following experiments were carried out in the pathology laboratory of the Beth Israel Hospital, New York. Adult rabbits were used. Under nembutal anesthesia and by means of the customary operating-room aseptic technique, an abdominal incision of from 1½ to 2 in long was made transversely in some, and longitudinally in others. The wound was then closed. Silk was used for suture material. The peritoneum and muscles were closed in a single layer and the skin edges united with a second layer of sutures. In some animals one angle of the wound was left open for a distance of about 0.5 cm. In others the wound was sutured loosely so that the peritoneum was not approximated accurately, an attempt being made to simulate the closure in the human being when the patient is straining and when small tears of the peritoneum occur. The animals were sacrificed at intervals varying from two to thirty-six days, and the abdominal wall was examined after it had been incised circumferentially at

a considerable distance from the original incision in order to avoid any disturbance of the findings at the site of operation. The results are shown in Table I.

TABLE I—RESULTS FOLLOWING EXPERIMENTS

| | |
|----------------------------|---------------------|
| Number of operations | 16 |
| Definite eversion | 6 (37 1/2 per cent) |
| Adhesion to abdominal scar | 7 (43 1/4 per cent) |
| Negative findings | 3 (18 1/4 per cent) |

In 6 animals there was found within the abdominal wall a definite gap into which the intestine had prolapsed and which had thus formed a definite eversion. In 7 instances the findings consisted of firm adhesions of the omentum or the intestine or both to the scar of the abdominal incision which had however closed completely. In the remaining 3 cases no abnormal status obtained. From these findings it is to be noted that at times the abdominal wound in spite of the deliberately formed openings closed completely before any of the abdominal viscera could find their way in and even before any adhesions could be formed. On the other hand in most instances (81 per cent) the abdominal viscera either attached themselves to the opening or actually found their way into it and thus produced definite eversion or firm postoperative adhesion with the scar. These experimental findings are in accord with the clinical findings of King in his investigation of postoperative hernia.

It seems quite reasonable to maintain that postoperative adhesions to the abdominal scar, postoperative incisional hernia and postoperative eversion are differences in degree only of the same pathological phenomenon and are due in all probability to the same factor, incomplete union of the peritoneum following inadequate closure.

J. THORNWELL WITHERSPOON, M.D.

Whipple A. O. and Elliott R. H. E. Jr. The Repair of Abdominal Incisions. *Ann Surg* 1938 108: 747.

The repair of abdominal incisions presents particular problems not encountered in other wound or other regions. These may be analyzed under the following headings:

1. The peculiar arrangement of the flexing and rotating muscles and the aponeurotic layers entering into the complex functions of the muscles of the abdominal wall.

2. Repaired abdominal incisions, especially those in the upper abdomen, are subject to stress and strain as a result of vomiting, coughing, hiccough, distention and the lifting and moving of the patient.

3. Abdominal incisions are more frequently contaminated with virulent aerobic and anaerobic organisms than any others. Activated enzymes at times are in contact with drained incisions in patients requiring intestinal repair and are followed by fistulas. In such cases not only is wound healing inhibited but actual digestion of the tissues and dissolution of the sutures may occur. Disruptions and ventral hernias occur most frequently in such wounds.



Fig. 1. (Six day wound catgut on the left side silk on the right side.) All silk fibers are separated by an ingrowth of fibroblasts and giant cells. In striking contrast there is no growth immediately around the catgut which is surrounded first by a pool of exudate, then degenerated muscle and then by granulation tissue on the outside of this. This is a very striking contrast. Note the difference in the thickness of the wall on the catgut and silk side due to excessive edema of the tissues where catgut was used. (Courtesy of J. H. Lippincott Co.)

4. In many elderly or cachectic patients suffering from prolonged malnutrition and vitamin deficiencies and requiring extensive resections of neoplasms from the gastro intestinal tract, the low serum protein content of the blood and tissues prevents normal healing and unquestionably predisposes to wound disruption.

Because of the factor mentioned above many surgeons employ heavy material for the repair of the abdominal layers and for tension or reinforcing sutures. A microscopic study of sections of wounds repaired under tension and with heavy materials reveals long transverse lines of tissue necrosis on each side of the repaired incision. Necrosis takes place until the tension between suture and tissue is relieved. This tension often resulting from the use of a continuous tight suture diminishes the blood supply to the very tissues in which the surgeon is attempting to encourage wound healing. Because of the fear of wound infection and sinus formation, catgut rather than non absorbable sutures are used by most surgeons in abdominal work. In wounds contaminated with lower ileal or colonic contents, non absorbable sutures should not be used but in such wounds and in those in which activated pancreatic ferments are apt to be present, catgut has serious drawback. The irregular and early absorption of both plain and chromic catgut sutures in such cases has been noted clinically and demonstrated experimentally. In addition in patients allergic to catgut the local reaction predisposes to infection and favors wound disruption.

The authors technique in closing abdominal wounds may be outlined as follows:

In incisions contaminated with ileal and colonic contents an abscess if present is drained with one or more soft rubber tubes or cigarette drains introduced through a small opening in a china silk tampon. The peritoneum is closed with interrupted No. 00 chromic catgut sutures about the drains and the

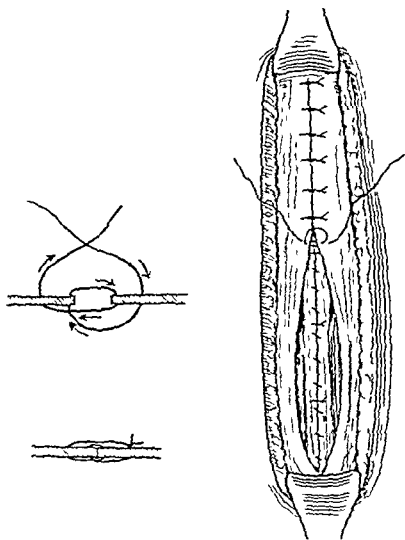


Fig 2 Closure of the anterior rectus sheath with "far-and-near" interrupted fine silk sutures

wound is packed with weak iodoform or zinc peroxide gauze around the drains inside the silk tampon. No attempt is made to suture the muscles, subcutaneous tissues, or the skin. If an abscess is not present, but the wound edges are contaminated with ileal or colonic contents, as in an open resection, a small Penrose drain is placed near the site of intestinal repair, the peritoneum is closed about it, and at least the central part of the wound is tamponed as in the case of an abscess.

In the repair of clean abdominal wounds, the authors tend more and more to employ fine silk. Catgut and silk should not be used together as catgut favors the growth of bacteria in the wound, and in an infected wound silk, unless very fine, is apt to act as a foreign body and result in the formation of sinuses.

In upper abdominal operations, the type of incision is determined chiefly by the width of the intercostal angle, the transverse incision being employed in wide-angled obese patients, and the split rectus incision in narrow-angled thin patients. Transverse incisions are preferred.

For closure of transverse and vertical incisions in the upper and lower abdomen the peritoneum and posterior rectus sheath or transversalis fascia are united with a continuous fine C silk or No. 00 chromic catgut, followed at 2 cm. intervals with interrupted sutures. The anterior rectus sheath and oblique muscle (in the transverse incision) are repaired with the same fine silk or chromic catgut by the use of a vertical figure-of-eight or "far and near" stitch at intervals of from 7 to 8 mm. These sutures are tied loosely, and because of lack of tension do not cut through or cause necrosis. No subcutaneous sutures

are employed. The skin is closed with interrupted silk sutures on separate cambric needles in order to prevent contamination by repeated puncture of the skin with the same needle and the same long suture. No retention sutures are employed.

In a control series of 300 cases, in which the abdominal layers were closed with catgut, and heavy retention sutures tied over pearl buttons were employed, the incidence of wound infections, disruptions, and postoperative hernias was substantially greater than in a series in which the technique described above was employed.

ARTHUR S. W. TOUROFF, M.D.

Windfeld, P. Circulatory Problems in Peritonitis *Acta chirurg. Scand.*, 1938, 81, 293

Windfeld calls attention to a number of notable reports made in recent years concerning the circulatory problems in peritonitis, which throw new light on obscure features, and which must therefore exercise a modifying effect on our conception of the pathogenesis of the disease. Experimental research into the circulation of the portal vein under normal and pathological conditions has given us important information as to what circulatory disturbances we may expect to find in peritonitis. The rhythmic movements of the intestine appear to influence the circulation in the portal system, but strong emphasis must be laid on the probability of separate movement of the intestinal mucous membrane, which constitutes another important motive force hitherto ignored. The rise of the blood pressure occurring in connection with peritonitis is a consequence of the meteorism, and is accounted for by the compression of the intestinal capillaries, with the contingent reduced passage of blood through the portal system.

The meteorism develops in the incipient stage of peritonitis at a time when we have no dependable evidence, either experimentally or clinically, of a circulatory insufficiency with stasis in the portal system.

The tardy fall in the blood pressure and the circulatory insufficiency are due to a universal capillary paresis which is particularly pronounced in the musculature, for instance, and which denotes a general intoxication of the disordered organism.

We must therefore conclude that collapse appears very late in the picture of peritonitis, and that "the heart cannot expect to find the fugitive blood" (to use Lichtenberg's simile) in the splanchnic blood vessels, but has to seek it everywhere in the dilated capillaries of the peripheral circulation.

CARL R. STEINKE, M.D.

Costa, L. A Case of Mesenteric Cyst (Sopra un caso di cisti del mesentere). *Riforma med.*, 1938, 54, 1012

Costa observed the case of a five-year-old boy who, when seen at the clinic, presented the picture of an acute abdominal involvement. The mother stated that this child had suffered similar attacks previously, especially in the winter. The individual

attacks were characterized by abdominal pain vomiting and marked prostration

Upon examination there was found a marked tenderness over the right lower abdominal quadrant accompanied by a pronounced abdominal rigidity. On the basis of these findings immediate surgical intervention was recommended

Under ether anesthesia a right pararectal incision was made extending from the inferior margin of the 11th rib to the bisiliac line. When the peritoneal sac was opened a seropurulent fluid escaped and a diffuse hyperemia of the serosa was noted. There was also found at about the middle portion of the ileum a bilobate tumefaction about the size of a seven month old fetal head. Aspiration of the cystic mass yielded a milky white odorless fluid containing ascariides. The cyst was removed and because of its intimate relationship to the intestine a segment of small intestine 30 cm. long was resected and a laterolateral entero-enteric anastomosis was performed. The post-operative course was good and the child made an uneventful recovery.

The fluid removed at operation was cultured bacteriologically and a hemolytic streptococcus was isolated. Histological examination of the pathological specimen revealed the presence of a pseudocyst of the mesentery and chronic appendicitis.

Various classifications of cysts of the mesentery have been proposed. Bonaccorsi distinguishes mainly true cysts and pseudocysts. The latter appear very similar to the true cysts grossly but on histological examination their walls are made up almost exclusively of connective tissue. Pseudocysts arise pathogenetically from trauma hemorrhage degenerative changes and inflammation and from other cystic tumors.

The symptomatology of mesenteric cysts is not well defined. At an early stage an abdominal tumefaction is often visible and this may be frequently associated with various gastro-intestinal disturbances such as nausea abdominal distention and constipation. The most important sign however is pain which appears intermittently and which is usually attributed to other conditions. This pain is as a rule due to torsion to pressure and to a reduction in the caliber of the intestinal lumen. If the cysts become large the patient will complain of a marked abdominal distention dyspnea vomiting crises of constipation and diarrhea and sometimes urinary disturbances.

The prognosis is bad in untreated cases. Spontaneous recoveries are very rare. The diagnosis is made in the presence of an abdominal mass and by means of the x-ray film. The condition should be differentiated from (1) retroperitoneal tumors (2) pedunculated ovarian cyst (3) intestinal tumors (4) hydropic degeneration of the gall bladder (5) cystic tumors of the pancreas (6) pedunculated cysts of the liver and of the spleen (7) neoplasms of the omentum and mesocolon and (8) pelvic neoplasms.

The final diagnosis is can be made only by an exploratory laparotomy.

Treatment is always surgical and the prognosis depends upon the presence of certain complicating lesions such as adhesions intestinal stenosis and hemorrhage. The cysts should be removed and if necessary an intestinal resection followed by a laterolateral entero-enteric anastomosis should be performed.

RICHARD E. SOXNER, M.D.

GASTRO INTESTINAL TRACT

Bennett T. I. Dow J. Lander F. P. L. and Wright S. Severe Hemorrhage from the Stomach and Duodenum. Criteria of Severity. *Lancet* 1938 235 651.

The authors have made a study of gastric and duodenal hemorrhage for the past three years. The chief purpose of their investigation was to obtain accurate information regarding the prognosis the cause of death and the best method of treatment.

The authors limited their observation to severe cases. The severity of any case can be judged only when it is known how much blood has been lost and whether bleeding has ceased temporarily or permanently.

A patient may be deemed to have had a dangerous hemorrhage (a) when there is a convincing history of the vomiting of a pint or more of blood or the passage of a large quantity of bright or changed blood per rectum and (b) when without obvious evidence of vomiting or passage of blood per rectum the patient has collapsed and shows clinical signs of severe hemorrhage such as a high pulse rate a fall in the blood pressure and in more severe cases a fainting attack or air hunger.

In the presence of such criteria it may reasonably be assumed that a patient is suffering from dangerous hemorrhage but a more definite degree of the severity of his state cannot be ascertained without data given by more precise observation. Such data are of extreme importance because the choice of treatment in each case must depend largely upon the severity of the condition. The need for blood transfusion or in rare cases surgery can be determined only when the exact extent and rate of the blood loss are known and this can be discovered only by estimation of the total volume of the blood.

The method employed for the estimation of blood volume was the dye method of Keith Pountney and Geraghty. Congo red was the dye of choice. The cell volume was calculated from the plasma volume and the hematocrit readings; therefore any error in the determination of the plasma volume was reflected in the cell volume.

The authors series comprised 122 cases and included the cases of several patients who were readmitted once or even twice. The patients were divided into three groups and classified according to the lowest blood volume figures obtained during their stay in hospital. Patients in Class I lost less than 20 per cent of their normal cell volume; patients in Class II lost from 20 to 50 per cent and patients in Class III lost over 50 per cent. Thirty three

patients were found to belong in Class I, 32 in Class II, and 57 in Class III. All patients, however, had been admitted because it was believed that their life was endangered by the hemorrhage.

Immediately after a very rapid and severe hemorrhage, an amputation of a section of the total blood occurs, which leaves the relative amounts of plasma and cells momentarily unchanged. Plasma volume and total cell volume are reduced by an equal fraction of the whole, the percentage of hemoglobin remaining unchanged. Fluid then passes into the blood from the tissue spaces to restore the plasma volume. In uncomplicated cases the total blood volume returns only as the lost cells are slowly regenerated. When the plasma volume is fully restored the hemoglobin percentage does not give an accurate measure of the blood lost.

In order to judge the severity of a case it must be known whether or not bleeding has ceased. It has been demonstrated that dilution of the blood by reconstruction of the plasma is the factor which brings about the fall in the hemoglobin percentage following hemorrhage, and that the varying speed at which this may be accomplished may give rise to a serious error if the hemoglobin percentage is accepted as a guide to the extent of the hemorrhage. The same process will create a still graver source of error if hemoglobin percentage is accepted as a guide as to whether hemorrhage has ceased or not. The total blood volume is the only certain guide. NORMAN C. BULLOCK, M.D.

Fallis, L. S. Perforated Peptic Ulcer. An Analysis of 100 Cases. *Am J Surg*, 1938, 41: 427.

This study, which is based upon 100 consecutive operations for perforated ulcer at the Henry Ford Hospital in Detroit in the period from June, 1917, to December, 1936, had for its primary objectives a consideration of the clinical factors which have a direct bearing on the mortality rate, and an evaluation of the various operative procedures. The author's material showed a definite seasonal variation. Thirty-three per cent of the perforations occurred in the summer months of June, July, and August, inclusive, which was more than double the percentage occurring during the months of December, January, and February. The author believes that the low incidence of perforation during the winter months and the high incidence during the summer months indicates the influence of diet on the perforation of peptic ulcer. His conclusion is that in the winter, when food is more concentrated and the amount of fluid is restricted, perforations occur less frequently than in the summer months when bulky meals predominate because of an increased consumption of vegetables and fruit, and the fluid intake is larger.

Occupation and the use of tobacco and alcohol were of minor significance, but trauma was definitely established as an etiological factor in 4 per cent of the patients. Two perforations occurred immediately after abdominal injury, and 2 in the course of fluoroscopic examination of the stomach after the ingestion of a barium meal. The old adage that "the

most dangerous place for an ulcer to perforate is in the hospital," was substantiated by the author. The temperature and pulse rate were of minor diagnostic value, but the leucocyte count in most instances increased rapidly with a polymorphonuclear predominance. The intra-abdominal fluid was clear in only 21 per cent of all the cases. Aspiration would therefore be of value in doubtful diagnoses. In 36 patients, a bacteriological study was made of the content of the abdominal fluid at operation. Twelve, or 33.3 per cent, gave a positive culture and 24, or 66.6 per cent, gave a negative culture. The mortality of patients with positive cultures was twice that of the series as a whole.

The operative procedures were simple closure, and closure with omental reinforcement, in 83 patients. In this group there were 15 deaths, a mortality of 18.1 per cent. Closure plus gastro-enterostomy, excision plus pyloroplasty, excision plus gastro-enterostomy, or excision alone was done in 14 patients with 2 deaths, a mortality of 14.3 per cent. This low mortality is not considered significant, however, because more surgery was undertaken in only those patients who were considered better risks.

The principal cause of death was found to be peritonitis, and for this reason drainage was the rule. It is the impression at the Ford Hospital that in most instances the use of drains was a life-saving measure.

The total mortality was 20 per cent. One death was definitely due to an over dose of ethylene. Another death occurred in a patient whose condition was so poor that the operation had to be performed under a local anesthetic.

The greatest single factor favoring recovery from a perforated peptic ulcer is prompt surgical intervention. The mortality rate for the first ten years in this series was 62.5 per cent. The mortality for the second ten-year period decreased to 11.9 per cent. The last 19 operations in this series of patients have all been successful. Earlier operation and improved pre-operative and postoperative treatment are the factors responsible for this reduction in mortality, and they are considered signs of surgical progress. The pre-operative administration of intravenous fluids, spinal anesthesia, routine blood transfusions, and continuous gastric suction have played a major rôle in saving the lives of victims of this serious abdominal emergency. The authors believe that the pre-operative and postoperative management of the patient is of greater importance than the experience of the operating surgeon, an opinion that is substantiated by the fact that the majority of patients in the first group were operated upon by members of the permanent surgical staff, and the majority in the second group were operated upon by the resident surgeons. SAMUEL J. FOGELSON, M.D.

Eliaison, E. L., and Thigpen, G. M. The Effect of Perforation on Peptic Ulcer Results. *Am J Surg*, 1938, 41: 419.

The authors' study of 70 cases of perforated peptic ulcer was undertaken in order to determine the end-

results following the various surgical methods used in the treatment of the 6 cases. After reviewing the literature and showing the marked diversity of opinion concerning the treatment of choice in cases of perforated peptic ulcer the authors review the results obtained at the Hospital of the University of Pennsylvania over the fourteen year period from 1922 to 1936.

The first observation was that the time interval between perforation and surgical intervention was the most important factor affecting the immediate operative mortality. The immediate mortality in the cases of perforated gastric ulcers and perforated duodenal ulcers was the same 25.43 per cent. Fifty-five patients recovered from their operations 47 of whom could be followed up. Nine were followed up for less than one year after operation 28 for more than one to five years and 10 for more than five years.

Of the patients with perforated gastric ulcer 3 who were treated by simple closure are well and 1 who was troubled with persistent ulcer distress had a second perforation a year after the original operation. At this time a gastro-enterostomy was done in addition to the secondary closure. Four of the 5 patients who had closure of the perforation plus primary gastro-enterostomy remained well and 1 complained of mild ulcer symptoms which were entirely controlled by diet.

Eighteen of the 21 patients with acute perforation of a duodenal ulcer were treated by simple closure. Twelve were completely relieved and 2 were benefited 4 had persistent ulcer distress and of these 1 experienced a second perforation three and one half years after the first operation 1 which required secondary closure with gastro-enterostomy. The patient recovered and has remained well. Two of the patients in this group required a secondary gastro-enterostomy for pyloric obstruction and neither of them has any further symptoms at present. One patient has persistent severe symptoms of recurrent ulcer which cannot be relieved either by diet or alkaline powders.

Of the 18 patients with acute duodenal perforation who were treated by closure plus primary gastro-enterostomy 16 were followed up. Twelve have no further symptoms 4 were not benefited and 2 of the latter now show evidence of jejunal ulcer. All 4 patients can be made comfortable by a restricted diet.

A comparison of the results of the 2 most frequently employed procedures viz simple closure of the perforation and closure plus primary gastro-enterostomy showed that 15 of 25 patients treated solely by simple closure recovered and 2 were benefited 4 were not benefited but could be cured by a secondary operation. The percentage of cure was 86.47 in this group. Sixteen of 22 patients who had been treated by closure plus gastro-enterostomy were well and 5 were benefited but none of these 5 apparently required further surgery. Seventy-six and two tenths per cent of the patients in this group were cured.

SAMUEL J. FOOTE, M.D.

Morley J. and Bentley F. H. Late Results of Partial Gastrectomy for Peptic Ulcer. *Brit. Med. J.* 1938 2 645.

Sixty-seven patients in whom a partial gastrectomy had been performed were re-examined after a period of from four to sixteen years. The average time of re-examination was eight and one half years post-operatively. These 67 patients did not represent a consecutive series but included only those from a series of 130 patients who could be traced and were willing to return for study.

Fifty-eight of the 67 patients had undergone a Shoemaker's gastrectomy and 9 had had a Polya gastrectomy. Fifty-two patients originally had gastric ulcer 6 had both gastric and duodenal ulcer 4 had gastric ulcer and a healed duodenal ulcer 4 had duodenal ulcer and 1 had an anastomotic ulcer. Thus most of the patients originally treated had gastric rather than duodenal disease.

The group of 9 patients who had undergone a Polya gastrectomy were shown to have depression of gastric function with bile regurgitation and complete absence of free acid. The blood picture showed 5 to have microcytic anemia and 1 macrocytic anemia. Six of the patients were in good health 2 were in fair health although with microcytic anemia and 1 had been in good health until pernicious anemia developed. There was no postoperative ulceration.

The 58 patients who had undergone a Shoemaker's gastrectomy were divided into two groups. Those in Group 1 showed marked depression of gastric function. There was a normal blood picture in 33 and a microcytic anemia in 12 38 were in good health 1 had been in good health for six years after which period a gastric carcinoma developed 6 patients were in fair health and 4 of these had a microcytic anemia but only 1 showed symptoms of ulcer.

The patients in Group 2 showed active gastric function and free acid above 20 c.c.m. N/10 was found to be present. The blood picture was normal in 31 a microcytic anemia probably secondary to a pulmonary tuberculosis was found in 1 the general health was good in 10 in 1 the general health had been good for seven years after which time a carcinoma developed and in 2 the general health was fair. One patient in the group with a high free acid value experienced a sense of epigastric uneasiness unless he ate frequently and 2 had definite post-prandial pain.

It is interesting to note that a high percentage of anemia was present not only in the patients who had undergone a Polya gastrectomy and who had depressed gastric function but in practically all of the patients who had had a Shoemaker's gastrectomy and showed depression of gastric function. This suggests that the cause of anemia may be associated with gastric hypofunction. The authors conclude that the rôle of hydrochloric acid in this connection has not been entirely proved and that still another factor—that of rapid gastric emptying—may be of

greater significance since it causes incompletely mixed, under-digested food constituents to be hurried through the duodenum and the upper part of the jejunum, and in this way interferes with the absorption of iron. The cause of these microcytic anemias, therefore, may be a diminished absorption of iron, secondary to the depression of gastric acidity. This opinion is substantiated by the observation that considerable improvement is obtained in these postgastrectomy anemias by the administration of massive doses of iron. However, it was further noted that in patients in whom gastric acidity was not depressed there was a risk of further ulcer development. This led to the conclusion that when gastrectomy is performed for gastric ulcer the objective should be to construct a stomach which will prolong the gastric emptying time and lessen regurgitation of the intestinal fluids. It is the opinion that this goal is more readily obtained with the Polya gastrectomy. This conclusion, the authors repeat, applies only to the surgical treatment of gastric ulcer. In duodenal ulcer, where the risk of recurrence is much greater, a more destructive operation has definite advantages.

SAMUEL J. FOGELSON, M D

Wangensteen, O H. Acute Bowel Obstruction: Its Recognition and Management. *New England J. Med.*, 1938, 219, 340.

Of all abdominal colics, only intestinal obstruction is characterized by recurrent intestinal borborygmi as the acme of concurrent crampy, colicky pains of short duration. Only strangulating obstructions and obstructions secondary to an inflammatory condition show tenderness and rigidity. X-rays of the abdomen are useful in the demonstration of gas in the bowel and in localization of the obstruction in the small bowel or colon. Occasionally barium must be administered to localize the process accurately. Vomiting is characteristic of obstruction of the small bowel. It is uncommon or occurs late in colon obstruction, in which condition the competent ileocecal valve prevents this symptom. Persistence of gas in the colon after evacuant enemas, with a relatively mildly distended small bowel, upon x-ray examination suggests partial occlusion, while the absence of gas in the colon under such circumstances points to a complete obstruction. The diameter of the colon has been found to be the best guide as to the degree of its obstruction.

The general effects of intestinal obstruction are dehydration, dechlorination, and loss of blood, the same as in strangulating obstructions. The effect on the bowel wall is a gradual compression of the vessels in the wall by increased intraluminal pressure until the wall becomes permeable to organisms lying in the lumen. Sustained increases in intraluminal pressure can occasionally lead to perforation in the colon because of the usual competence of the ileocecal valve. This rarely occurs in the small bowel because of the decompression that is produced by vomiting.

Saline solution is specific for the dehydration and demineralization which occur as the result of high obstruction, but it is of small direct value in colon obstructions.

Blood transfusions are indicated for patients with strangulating obstructions, in whom a rapid pulse indicates a severe blood loss, and in whom there is a marked transudation of fluid from the portal system.

The inhalation of high concentrations of oxygen is believed to be of aid in the treatment of abdominal distention.

Strangulating obstructions are immediately surgical, but they may be treated as simple obstructions after release of the strangulating mechanism if the bowel is still viable. Mesenteric thrombosis or embolism, and all other conditions in which the bowel is not viable, should be treated only by exteriorization of the non-viable segment.

Simple obstructions, particularly of the adhesive type, frequently respond satisfactorily to suction applied to an indwelling duodenal tube. The addition of a balloon to this tube may expedite its passage into the lower reaches of the small bowel, but it usually makes passage through the pylorus slightly more difficult.

The choice of operative procedure for obstructions of the small bowel should be the simplest procedure possible—i.e., enterostomy. The author cautions particularly against evisceration, dissection of loops of bowel from adhesions, and entero-anastomosis.

For simple obstruction of the colon, the author recommends a decompression operation, preferably in the transverse colon if this is possible.

THOMAS C. DOUGLASS, M D

Wheeler, D. Diverticulum of the Duodenum. *Canadian M. Ass. J.*, 1938, 39, 214.

Diverticula of the duodenum are classified as primary and secondary. A primary diverticulum is one which occurs without any obvious cause, its wall is formed by the mucosal and submucosal coats. These diverticula are found in the second, third, and fourth portions of the duodenum. Secondary diverticula are considered as having an obvious cause. These are found in the first part of the duodenum and their walls are made up of all the coats of the intestine.

The following table shows the incidence of duodenal diverticulum as found by several workers on cadaver or post-mortem material.

TABLE I—PERCENTAGE OF ALL TYPES OF DIVERTICULA FOUND POST MORTEM

| Author | Post mortems | Cases of diverticulosis | Percentage |
|-----------|---------------|-------------------------|------------|
| Linsmayer | 1,367 | 45 | 3.3 |
| Baldwin | 105 | 15 | 14.2 |
| Grant | 37 (cadaver) | 6 | 16.0 |
| Grant | 133 (cadaver) | 15 | 11.3 |

Table II indicates the frequency of the condition discovered by roentgen examination.

TABLE II—FREQUENCY OF SUCCESSFUL ROENTGEN EXAMINATION

| A. th | Case x m ed | Cases d u t u l | Per tag |
|--------------------------------------|----------------|-----------------------|------------|
| Case | 6 847 | 85 | 12 |
| Andrews | 2 200 | 26 | 0 18 |
| Spengs and Marxer | 1 000 | 38 | 3 8 |
| Cryderman | 770 | 40 | 5 19 |
| J C McWilliam (quoted by Maclean) | 653 | 10 | 1 5 |

Secondary diverticula occur in the first part of the duodenum and are the result of scarring and contraction due to an ulcer with pouch formation this pouch being the diverticulum. This obstruction of the duodenal cap which is due to scarring causes a stenosis and if the obstruction is of sufficient severity the proximal portion of the cap will dilate. This type of diverticulum will have all the coats of the bowel remaining in it wall. Since the diverticulum is the result of an underlying condition e.g. ulcer it gives no symptoms. Most patients have therefore been treated by operation designed to cure the primary trouble.

Primary diverticula have the following characteristics (1) they are found only in the second third and fourth parts of the duodenum (2) the most frequent site being the second portion (3) they are found on the inside of the duodenal loop and are therefore in relationship to the head of the pancreas (4) they are often multiple when they are usually seen as goblet shaped protrusions of the mucous membrane communicating with the lumen of the duodenum by a narrow neck (5) they vary in size from that of a small pea to that of a small walnut and (6) they are more frequently seen after the fifth decade.

The author discusses the various theories which attempt to explain the cause of these diverticula. In the main these theories suggest the condition to be either acquired or congenital.

There are no definite signs or symptoms which are pathognomonic of these pouches. The history is usually of long standing. The patient complains of a feeling of heaviness and distention after eating per haps of nausea and vomiting and sometimes diarr hea. The only method of diagnosis of these pouches is by use of the barium meal.

The author agrees with Odgers statement that the great majority of these pouches do not cause any trouble and since their demonstration by x ray their significance has probably been exaggerated. Maclean however maintains that in the e cases in which there is a definite peridiverticulitis and pancreatitis from the embedding of these pouches in that gland surgical removal offers definite promise of relief. However it is customary to try medical treatment first such as postural drainage and lubrication and disinfection of the diverticular pouch.

The case of a large traumatic diverticulum (probably secondary to damage of the duodenal wall during cholecystectomy) is reported.

JOHN H. GARLOCK M.D.

Carabba G and Baccarani C. The Combined Excretion of Bacteria by the Tonsils and the Appendix (Ricerche sperimentali sulla funzione e critezza batterica associata tonsillo appendicolare). *Ann Ital di chir* 1938 17 571.

The coexistence of inflammatory processes of tonsils and appendix has been repeatedly noticed but the importance of tonsillitis in the pathogenesis of acute appendicitis has not been sufficiently emphasized in spite of the anatomicostructural similarity between both organs. Rosenow demonstrated that bacteria injected into the blood of experimental animals could be found in the appendix and tonsils of these animals. The physiopathological interdependence of both organs represents an obscure problem and its demonstration is difficult.

The authors injected a suspension of four loops of a forty eight hour-old culture of staphylococcus albus in 2 c cm of a physiological saline solution into the marginal vein of rabbits and killed the animals six twelve eighteen or twenty four hours after the injection. The entire Waldeyer's lymphatic ring and the appendix with the mesenterolum were embedded in paraffin and studied histologically. No cultures were made because the presence of micro-organisms in the oral cavity or the lumen of the appendix would interfere with the results and on the other hand negative results of the cultures would not exclude the presence of bacteria in more deeply situated tissues.

The histological sections revealed the presence of the injected bacteria in the appendix and the tonsils. Apparently not all the bacteria injected were excreted by both organs because a certain number of them were found in the efferent vessels of the appendix and the tonsils.

JOSEPH K. NARAT M.D.

Shipley A M. The Treatment of Peritonitis Complicating Appendicitis. *New England J Med* 1938 219 333.

The knowledge of when to operate and when and how to drain constitutes the most important problem in peritonitis complicating acute appendicitis.

The author states that in this paper peritonitis which is not accompanied by gross rupture of the appendix is regarded as early while the gross contamination which occurs after rupture is called late peritonitis. His study is based on 1106 cases of acute appendicitis at the University Hospital in Baltimore classified as follows:

| Condition | Cases | De th |
|---|-------|-------|
| Chronic and recurrent appendicitis | 479 | 2 |
| Acute appendicitis without peritonitis | 354 | 2 |
| Early peritonitis | | |
| Thrombotic gangrenous or suppurative cases—no drains | 49 | 1 |
| Same except with drainage of abdominal wall only | 28 | 0 |
| Same with intra abdominal drains because of uncertainty of closure of stump of appendix | 4 | 0 |
| Late peritonitis | | |
| Localized | 41 | 1 |
| Diffuse | 40 | 28 |

Patients with early peritonitis were treated by immediate appendectomy, with drainage of the abdominal wall after closure of the peritoneum. Also included in this group were a number of patients in whom rupture of the appendix had sealed off and had therefore seemed to constitute an indication for the same procedure.

So-called late peritonitis is not always a direct result of the time factor, cathartics, the obstructive type of appendicitis, and appendicitis in young children all tend to speed up the process. The severity of the process seems to depend on the type and number of micro-organisms which are present. The disease may be localized, diffuse, or subsiding.

Localized peritonitis may be so from its onset, or it may occur as the result of conservative treatment of a diffuse peritonitis. The author believes that the abdomen should be opened and drained and that no attempt should be made to remove the appendix as soon as localization seems well established.

Diffuse peritonitis of the late variety is probably best treated conservatively, that is, by Wangenstein suction, morphine (without atropine), the application of heat or cold to the abdominal wall, the control of dehydration and acid-base imbalance by means of large quantities of salt solution and glucose, and decompression of the colon with the enema tube.

The McBurney incision is used because of the need for fewer sutures, the prompt falling together of the tissues as the infection subsided, the absence of hernia or evisceration, and the easy access to the areas to be drained.

Drainage material should be soft and small, because hard drains cause necrosis and large ones have a tendency to plug up the opening.

THOMAS C DOUGLASS, M D

Walker, I J. Immediate or Deferred Surgery for General Peritonitis Associated with Appendicitis in Adults. *New England J Med*, 1938, 219, 323.

Because of a mortality of 33 per cent in appendiceal general peritonitis in the Boston City Hospital, in the years from 1927 to 1930, the author became interested in the subject. The following classification of peritonitis was used: local peritonitis, abscess of the appendix, spreading peritonitis, and generalized peritonitis. The last type included only patients presenting a history of acute appendicitis and having a generalized spasm and tenderness of the abdomen.

The study includes 105 cases which came under the classification of generalized peritonitis and which were found among 5,371 cases of acute appendicitis which were admitted to the Boston City Hospital. Three cases were omitted from the study because of the moribund condition of the patient on arrival, or because of missed diagnosis. Seventy-seven patients were treated by immediate surgery, and 25 by deferred surgery. There were, in addition, 5 private cases treated by deferred surgery.

The mortality rate in the series of 77 patients who were immediately operated upon was 42 per cent. Fourteen of the 32 deaths occurred in the first twenty-four hours following surgery, which seemed to indicate that patients with outstanding toxemia might profitably be treated for such time as is necessary to improve the general condition before operating.

Therapy in the cases treated by deferred surgery consisted of the withholding of food and fluids by mouth or rectum, and the maintenance of the fluid and mineral balance by parenteral fluids, salt, and glucose. Wangenstein drainage was instituted in some cases. Blood transfusions were given for anemia, septicemia, or for prolonged sepsis. When peristalsis was spontaneously established, small and increasing amounts of fluid were allowed by mouth. Diarrhea was troublesome in a few cases and was common in the series. Two patients recovered without the formation of abscesses. In the remaining 28 patients there were 48 abscesses, 20 of which were located in the pelvis. In the 30 cases treated by deferred surgery there were 4 deaths. After all the symptoms of inflammation had subsided for a period of from three to four months, all appendices were removed for confirmatory evidence. The author believes that 23 of the 30 patients treated by delayed surgery were placed in a more favorable condition for surgery after treatment for from twenty-four to forty-eight hours, and that the remaining 7 patients were in a no more serious condition than they were on admission.

Deferred operation has no place in the treatment of the acute, unruptured appendix. It should be considered for those patients who are found to be desperately ill with fulminating peritonitis only when and if the surgeon is equipped in every way to carry out the necessary procedures.

THOMAS C DOUGLASS, M D

Ladd, W E. Immediate or Deferred Surgery for General Peritonitis Associated with Appendicitis in Children. *New England J Med*, 1938, 219, 329.

The author notes the increasing mortality attributed to appendicitis and cites the negligible mortality associated with early operation as an imperative reason for making a serious study of the dilemma of late diagnosis and delayed operation.

He carefully outlines the usual symptoms of the disease and the accepted routine for examining a child so as to obtain the most accurate information possible. The prohibition of cathartics is stressed. The laboratory findings and the differential diagnosis as they apply specifically to children are reviewed.

The question of immediate or delayed surgery is believed to be entirely a surgical one. The Ochsner treatment is outlined, and it is stated that partly because of a shorter omentum and possibly because of other factors, a process in the abdomen does not localize as well in children as it does in adults.

The procedure at the Children's Hospital of Boston is to operate on all patients as soon as they can be properly prepared. The delayed operation is reserved for the occasional profoundly toxic dehydrated distended patient with sunken eyes and a rapid feeble pulse. In such cases the operation is performed after preparation for a day or so with parenteral fluids, decompression and other measures.

The right rectus incision is used except in the few cases in which the appendix seems lateral to the cecum. The appendix is not always removed. Drains are usually placed in the iliac fossa and the pelvis and are left in place for about a week. Postoperative care consists in placing the patient in Fowler's position and the use of parenteral fluids, morphine and Wangersteen suction if postoperative distention or vomiting occurs. Oxygen up to 90 or 95 per cent is allowed in those cases which show marked distention with some beneficial results.

In 632 cases of acute appendicitis the mortality was 3.5 per cent. In 204 cases of gross rupture of the appendix the mortality was 7.3 per cent.

THOMAS C. DOUGLASS, M.D.

Gilchrist, R. K. and David, V. C. Lymphatic Spread of Carcinoma of the Rectum. *Ann Surg* 1938 108 622.

The operability and prognosis in patients with carcinoma of the rectum depend on the presence and extent of lymphatic metastases as well as on the degree of local extension of the tumor and the absence of blood borne metastases to the liver, lungs,

bones and brain. The present study was undertaken in an effort to determine the incidence, extent and location of lymph node metastases and the extent of radical removal necessary to insure eradication of all involved nodes.

The authors developed a technique to study accurately all lymph nodes surgically removed with cancer of the rectum. Specimens studied in this way have had from 20 to 80 nodes per specimen.

The average number of nodes in 25 transparent specimens removed by the Miles type of abdominoperineal resection of the rectum was 52.1 nodes per specimen. Sixteen of the 22 specimens studied by gross dissection had lymph node metastases and 16 of the 25 specimens studied by the method of clearing had metastases, an average of 63.1 per cent of all specimens studied.

Tumors arising predominantly on the mesenteric border of the bowel seem to metastasize to the lymph nodes more frequently than those arising on the antimesenteric border.

The duration of symptoms seem to have less effect than one would suppose on the number of nodes involved in operable cases. Three patients who had had symptoms for four months or less had 12, 25 and 28 involved nodes respectively while 3 patients who had had symptoms for from twelve to eighteen months had 0, 2, 3 and 43 involved nodes respectively.

Analysis of the specimens studied has led the authors to the following conclusions:

(1) The size of the tumor has little bearing on the presence or absence of lymph node metastases.



FIG. 1. Gross specimen and photomicrograph. A photograph of the cleared transparent preparation of the lymph node shows the arterial tree as branching black lines. The lymph nodes are represented by the photomicrographs seen throughout the tissue. The accompanying diagram

shows the location of the lymph nodes. The carcinoma is indicated by white black dots. The normal lymph nodes are represented by hollow circles. (Courtesy of J. B. Pincott Co.)

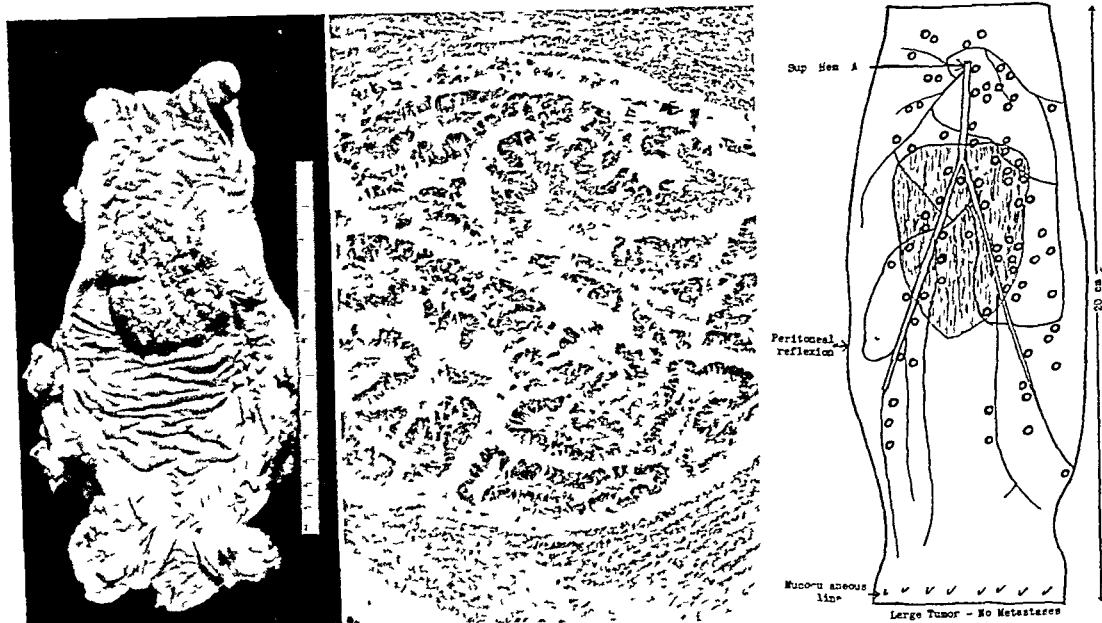


Fig 2 Showing an instance of a large tumor without the occurrence of any metastases

(2) Low-lying tumors may have very high metastases

(3) When the upward lymph channels are blocked by metastases, there may be a retrograde metastasis downward

(4) When the tumor is found at the level of the levator-ani muscle, there is double lymph drainage. The more common direction is upward along the superior hemorrhoidal artery, the other is laterally along the superior surface of the levator-ani muscle

(5) Squamous-cell carcinomas which involve the mucosa may have a double lymphatic involvement

(6) Post-mortem examination shows that radical removal with as high resection of the superior hemorrhoidal artery as possible and wide resection of the levator-ani muscles is necessary for the best chance of cure

NORMAN C BULLOCK, MD

Eiken, T Radical Treatment of Carcinoma of the Rectum (Ueber die Radicalbehandlung des Rectumcarcinoms) *Acta chir Scand*, 1938, 81 155

The author attempts to evaluate the results of the different surgical procedures for carcinoma of the rectum in 1,444 cases gathered from the material in the clinics of the surgeons of Denmark in the years 1931 to 1935, inclusive. This material is peculiar in that not more than 300 cases of rectal carcinoma occur yearly in all Denmark and not more than 10 cases occur yearly in any one clinic. Danish operators, therefore, probably do not attain the finished experience of individual surgeons in other regions.

The mortality for the one-stage, combined abdominoperineal procedures for Denmark is 70.6 per

cent, for the two-stage procedures the figure drops to 49 per cent, however, when the deaths following the first-stage operation are added and the cases in which the second stage was not carried out for any reason are taken into account the percentage rises to 64.5 per cent. The perineal, i.e., perineosacral, excisions exhibit a much lower mortality (27.6 per cent).

The Danish material is not believed to be of much value for evaluating late results, but in foreign countries, in which both the abdominoperineal and the perineal (perineosacral) methods are employed in extensive series by the same surgeon, the percentage of permanent, three to five-year, cures is not so different for the two methods. (For figures from European and American sources the reader must refer to the original article.) This percentage is also not very far from that figure which careful histological studies have indicated as representative of the incidence of involvement of the regional lymph nodes in these cases of rectal cancer. Therefore, it is thought that the perineosacral methods are practically as radical, in their recently developed forms, as the more extensive abdominoperineal methods.

The percentages of permanent cures reported from all sources would seem to encourage attempts at radical removal, however, it is believed that the perineosacral methods are preferable for all rectal cancers which are judged operable and are not situated above the upper limit of practicability for the perineosacral methods, 10 cm above the anus. It is recommended that in Denmark all procedures be

two stage with several weeks intervening between the first and second stages of the operation

JOHN W. BRENNAN, M.D.

LIVER, GALL BLADDER, PANCREAS AND SPLEEN

Boyce F. F. and McFetridge E. M. *Studies of Hepatic Function by the Quick Hippuric Acid Test I. Biliary and Hepatic Disease II. Thyroid Disease III. Various Surgical States*
Arch Surg. 1933 37 401 427 443

The established functions of the liver include

1. The metabolism of carbohydrates
2. The metabolism of proteins
3. The metabolism of bile
4. The coagulation of the blood
5. The detoxification of poisons, bacteria and other harmful substances
6. The thermogenic function

At the present time the majority of tests for hepatic function are highly unsatisfactory until the disease is so far advanced that the information which they supply is no longer necessary. The various tests of liver function which have previously been proposed may be classified under the headings of the various functions which they are intended to reveal.

Tests of carbohydrate function include the galactose test and the levulose tolerance test. Both are based on the theory that in persons with hepatic dysfunction the rate of utilization of a predetermined amount of carbohydrate will be slower than in normal persons and therefore a greater amount of the substance will persist in the general circulation and be excreted in the urine. However, too many factors are involved in the mechanism of sugar metabolism to make the tests at all reliable aside from the fact that there is a wide variation in the rate of utilization of dextrose by normal individuals.

2. Studies on nitrogen partition have proved of no particular value because extremely severe hepatic damage is apparently necessary to cause any significant alteration in these values.

3. Tests of bile metabolism include the icteric index test, the Van den Bergh test, the Fouchet test, the urobilinogen test, the test for bilirubinuria and the bilirubin test.

The Quick hippuric acid test possesses most of the advantages and is free of most of the disadvantages of the tests previously employed. The synthesis of hippuric acid is a process of detoxification which is brought about by the conjugation of benzoic acid and amino acetic acid. The product of the conjugation is eliminated in the urine as hippuric acid except for a small fraction which is conjugated with glycuronic acid and eliminated as glycuronic acid monobenzoate. There is no store of preformed amino acetic acid in the body. The liver has a maximum hourly synthesis of endogenous amino acetic acid and in the absence of an exogenous supply cannot produce more than this maximum amount to combine with the benzoic acid ingested. The rate of

synthesis of hippuric acid is therefore governed by the ability of the organism to produce amino acetic acid. Since the liver is the site of synthesis of this acid it can reasonably be assumed that the synthesis will be adversely affected in the presence of certain types of hepatic damage and that the output of hippuric acid (which will be correspondingly diminished because of the lack of amino acetic acid to combine with benzoic acid) will serve as an index of this damage.

The test is based on a normal physiological process and therefore involves no strain on the liver. No conclusive proof exists, however, that the liver is the sole site of the synthesis of hippuric acid. If renal damage is also present, the hippuric acid is retained as a nitrogenous product would be and the test must be interpreted in the light of that fact. The hippuric acid test of Quick should always be checked by the urea clearance test of Van Slyke.

The unpleasant taste of the sodium benzoate which is administered can be overcome by the addition of a small amount of cherry syrup. A single test does not furnish adequate information as to the state of the liver.

Highly significant in the 82 cases of disease of the liver and biliary tract which were tested is the marked impairment in liver function after operation. The slow return to normal after cholecystectomy suggests the doubtful wisdom of prolonged drainage of the biliary tract. The results of the test show the importance of pre-operative preparation and postoperative care in cases of biliary disease.

Studies with the Quick test have made it clear that the premises on which dextrose has been used to bolster the liver are entirely sound. The effect on the hepatic function of its use and withdrawal is sometimes dramatic.

The relationship between hepatic function and urinary output is clear. The prognosis in cases of hepatic disease can be based on the occurrence or failure of spontaneous diuresis. Many explanations of the relation between hepatic and renal function have been advanced. The most probable explanation is that a lack of amino acetic acid brings about a cessation of glomerular function. On this basis it seems not unreasonable to assume that the liver, by means of the amount of amino acetic acid released into the circulating blood stream, actually determines renal function. If this is true the progressive oliguria passing over into anuria which is the outstanding characteristic of the deferred liver death or liver kidney syndrome may be interpreted as due to a diminished synthesis of amino acetic acid in the liver. Certainly the improvement following the administration of decalin sodium, with the resulting improvement in the synthesis of amino acetic acid and in the formation of bile salts, seems to support this view.

The important consideration is that a patient who exhibits a damaged hepatic function before operation as manifested by a failure of synthesis of amino acetic acid becomes a doubly poor risk if he also pre-

sents signs of renal damage, such as a raised urea content in the blood and a low urea clearance

The most common cause of postoperative delirium and disorientation after operations on the thyroid gland is hepatic failure. The sudden and extreme hyperpyrexia which may occur postoperatively and even pre-operatively, the jaundice which is sometimes slight and transient but more often deep and terminal, and the benefit produced in cases of thyroid disease by the measures ordinarily used to combat hepatic damage, all seem to establish this thesis. The actual pathological changes which are present in these cases at autopsy may be roughly classified as fatty infiltrative changes, degenerative changes ranging from those of a mild type to actual necrosis, cirrhotic changes, and acute yellow atrophy.

The results of the Quick test in the presence of hyperthyroidism show that the liver function undergoes a more frequent and more intense change than has been previously suspected. The changes in function correspond to the hepatic changes demonstrated pathologically and furnish an ample basis for explanation of the thyroid crisis. The degree of dysfunction is related to the clinical severity of the disease and to the degree of toxicity, as indicated by the basal metabolic rate and by the necessity for operation in stages. Improvement in function occurs with pre-operative preparation. There is no correlation between the hepatic function, as demonstrated by this test, and the duration of the disease or the amount of weight lost.

More should not be read into this test than it can tell. It interprets hepatic damage in terms of function. Repeated tests indicate alterations in function, but a single test and repeated tests tell nothing else. It is not an index of the type of risk represented by the patient with thyrocardiac disease, for whom the cardiac damage wrought by the hyperthyroidism is the outstanding consideration. The test is no index of possible respiratory failure or of any other complication except hepatic damage.

When dextrose is used as a postoperative measure in cases of the toxic type, there is a distinct decrease in the mortality from thyroid disease.

The role of the liver in all types of surgical disease is more important than is generally suspected, and it is as important to consider the liver in evaluating the surgical risk as it is to consider the heart, the kidneys, and the lungs.

In patients who undergo elective operations for conditions not connected with the biliary tract or thyroid gland (appendectomy and hernioplasty), there is a distinct impairment of hepatic function postoperatively. There is approximately a 25 per cent drop in hepatic function with ether anesthesia, and an even greater fall with spinal analgesia. It is least marked with ethylene anesthesia.

It is well to guard against this impairment of hepatic function, in even sound subjects, by such simple measures as the oral administration of carbohydrates, particularly dextrose, before and immediately after operation. It is wise to do this as a mat-

ter of routine because of the occasional unexpected death which follows even elective operations on supposedly sound persons. SAMUEL KAHN, M D

Brown, P. W., and Hodgson, C. H.: Late Results in the Treatment of Amebic Abscess and Hepatitis of the Liver. *Am J M Sc*, 1938, 196. 305

Brown and Hodgson present a study of 35 cases (18 surgical and 17 medical) of abscess of the liver encountered during a period of eighteen years at the Mayo Clinic. The results of their study show that the infection occurs most frequently in middle-aged male patients. A syndrome of pain in the upper right quadrant of the abdomen, often referred to the shoulder, associated with fever, chills, leucocytosis, and possibly with diarrhea and jaundice, should suggest hepatic involvement and, if relieved by anti-amebic treatment, should be an indication of amebic infection.

The authors believe that the efficacy of the anti-amebic treatment can be measured partially by the remarkable results obtained in their relatively small series of 35 cases. A follow-up study of the late results in these cases revealed that 12 of the 14 medical patients, and 14 of the 18 surgical patients are apparently well at the present time. The nucleus of their treatment of this dreaded infection lies in their slogan "Emetine to check the acute symptoms and arsenic to wipe out the amebas." They contend that the employment of this method is desirable as well as justifiable until another method which is just as effective and causes less toxicity is made available.

EARL GAPSIDE, M D

Impallomeni, R.: Cholecystography Performed with More Physiological Methods (Per una piu fisiologica indagine colecistografica). *Radiol med*, 1938, 25 383

Impallomeni states that in the past few years many new methods have been devised to obtain a rapid roentgenological visualization of the gall bladder. These various studies and experiments were designed to eliminate the many difficulties involved in the interpretation of cholecystograms and in the comparison of these cholecystograms with the anatomicopathological findings.

Cholecystography in reality represents a test of the functional capacity of the liver. The principle is based upon the fact that the gall bladder definitely reflects the functional activity of the hepatic cells in response to the biligenetic action of the contrast substance.

Impallomeni recommends the intravenous administration of the contrast substance rather than the peroral because he believes that the gastro-enteric factor interferes markedly with cholecystography. In order to study this problem more completely, he performed Graham's test in a series of individuals who did not present any biliary pathology worthy of note. No cathartic or special type of diet was prescribed the day before the test, in order to render the

conditions as nearly physiological as possible. Under the conditions the shadow of the gall bladder began to appear about two hours following the injection. If bile salts were administered intravenously at the same time the shadow of the gall bladder appeared as early as fifteen minutes following the injection.

The author's method of performing a cholecystography may be briefly summarized as follows: there are no special preparations to be observed on the day prior to the test. On the following morning the patient is kept in a fasting condition, a cleansing enema is given and an intravenous injection consisting of 30 c cm of Endocoleflamine Erba and 10 c cm of Didrocol Recordati is made slowly. The films are taken during the first and second hours.

In normal subjects the first film shows a well defined outline of the gall bladder. In the second film the gall bladder shadow appears denser. If the films obtained are not satisfactory another film should be taken after the fourth and after the fifth hours. In individuals presenting retarded biliary secretion of the liver or retarded absorption by the gall bladder the greatest density of the shadow is observed at the fourth or fifth hour. In the majority of cases however the outline of the gall bladder can be visualized during the first and second hours following the intravenous injection. If no visualization can be obtained at the fifth hour a last film may be tried at the tenth hour although in such cases the probabilities of visualization are very slight.

Because of the lack of experimental work no definite conclusions are drawn concerning the application of the principles to pathological cases.

Impallomeni also conducted a series of experiments showing that certain hepatic amino acids not only have a marked biligenetic effect but also exert a decided detoxifying action. With the aid of these amino acids the gall bladder may be visualized as early as the first hour following the injection. The maximum density of the shadow is observed at the third hour. The author believes that the addition of these amino acids also attenuates the toxic effects of the contrast substance. RICHARD E. SOMMA, M.D.

Copher, G. H. The Surgical Treatment of Common Duct Stones. *Surg Clin N Y* 44: 193 18 1369.

The author points out that the absence of pain in the presence of jaundice does not rule out the possibility of a stone in the common duct as a considerable number of patients with this condition have absolutely no pain during their illness.

It is safer not to operate on a patient while the icterus index is rising but to wait until the index maintains a constant level or is falling. The bleeding and clotting time of all patients with jaundice should be ascertained before operation. Patients with severe jaundice are very apt to bleed postoperatively in spite of normal bleeding and clotting times. Blood transfusions and glucose solution administered intravenously should be given pre-operatively. Donors should be available during the operation and

postoperatively in case additional transfusions are needed.

To palpate the common duct the author goes to the left side of the operating table.

In general the indications for exploration of the common duct are (1) a history of jaundice, chills and fever, (2) a thickening and enlargement of the common duct, (3) a thickening of the gall bladder and especially an associated thickening of the head of the pancreas, (4) the presence of many small stones in the gall bladder and cystic duct, (5) the inability of the surgeon to determine whether obstructive jaundice is intrahepatic or extrahepatic in location and finally (6) the presence of definitely palpable stones in the common duct. The duct is identified by aspiration with a fine needle. After exploration and removal of the stones from the common duct the duct is irrigated with saline solution to wash out sand or small stones. The papilla of Vater is dilated mechanically. The common duct is drained by a catheter introduced toward the hepatic ducts. The author does not consider it necessary to gradually decompress the biliary system after relieving complete obstruction of the common duct.

The gall bladder is not removed until after the surgery of the common duct is completed. The common duct catheter and a rubber dam drain are brought to the surface through a stab wound. The drain is removed in four days. The catheter in the common duct is usually removed in from ten to fifteen days except when there is pus in the drainage or if deep jaundice was present pre-operatively.

If cholangiography is desired a 48 per cent solution of hippuran is preferred to heavy opaque oils for contrast material as it is less likely to obscure small stones. CARL O. LATIMER, M.D.

Twiss, J. R. and Barnard, J. H. Disease of the Biliary Tract Associated with Disturbances of the Cholesterol Metabolism. *J Am M* 155 938 121 990.

Disturbances of the cholesterol metabolism although generally conceded to be a major contributing cause in the formation of gall stones are as yet little understood. Cholesterol is both exogenous and endogenous in source. Because of the partial exogenous source the dietary treatment of disease of the biliary tract associated with hypercholesterolemia is based on a two fold hypothesis: (a) that hypercholesterolemia may result from the excessive ingestion of food which are high in cholesterol and fat content and (b) that a reduction of cholesterol intake by patients having hypercholesterolemia causes a decrease in the amount of cholesterol in the blood. It may be stated that a relative increase in the cholesterol concentration of the gall bladder bile particularly in the presence of infection or stasis may result in the precipitation of cholesterol and the formation of stones.

The authors investigated a series of patients with disease of the biliary tract and hypercholesterolemia. All patients with jaundice or obstruction of the

common duct were eliminated by the exclusion of those in whom the icterus index was elevated. The studies may be summarized as follows:

1. A series of 110 medical and surgical patients with disease of the gall bladder and associated hypercholesteremia were placed on a low cholesterol diet. A control series of 35 patients did not receive this diet.

2. Of 80 medical patients 82 per cent showed an appreciable reduction in the blood cholesterol, 80 per cent were symptomatically benefited. Fifty per cent of the control group showed an inconsequential reduction of the blood cholesterol, 33 per cent were symptomatically benefited.

3. Sixty-seven per cent of the 30 surgical patients placed on the low cholesterol diet after cholecystectomy showed an average reduction in blood cholesterol of 24 per cent, 79 per cent were symptomatically benefited. In the control group 65 per cent of the patients showed an average reduction in blood cholesterol of 5 per cent, and 64 per cent showed symptomatic benefit.

4. Among the surgical patients who had symptoms after cholecystectomy and were treated with the low cholesterol diet, 10 per cent of those showing a reduction in blood cholesterol were not benefited. In the control group 40 per cent were not benefited.

5. Minimum readings of the blood cholesterol were obtained within the first eight months for 93 per cent of the medical patients on the low cholesterol diet, whereas after cholecystectomy minimum figures were obtained only after eight months for 50 per cent of the patients.

6. Twelve patients with gall-bladder disease and a normal value for blood cholesterol pre-operatively had hypercholesteremia after cholecystectomy.

The authors concluded that

1. The low cholesterol diet has been found by repeated chemical analyses to reduce the blood cholesterol in cases of hypercholesteremia.

2. The low cholesterol diet gives symptomatic relief in most of these cases.

3. The diet is indicated after cholecystectomy, to preclude hypercholesteremia and recurrent symptoms.

ARTHUR S W TOUROFF, M D

Manson, M H., and Eginton, C T. The Cause of Death in Bile Peritonitis. *Surgery*, 1938, 4: 392.

Although bile peritonitis is relatively uncommon, it is a complication which accounts for a significant number of deaths following operations upon the biliary tract. The mortality is usually given as about 50 per cent. Controversial opinions have been expressed as to the cause of death in these cases. Some believe that if the bile is sterile it is innocuous. Others believe that even if the bile is sterile it may cause death as the result of the toxicity of its components, especially the bile salts. A third theory is that death is due to endogenous infection, especially by *Clostridium welchii*. Finally, shock from associated fluid loss has been designated by some as the chief lethal factor.

In order to demonstrate the noxiousness of intraperitoneal sterile bile and, more specifically, to determine the cause of death in choleperitoneum, several series of animals were subjected to experimental procedures. The results of the experiments may be summarized as follows:

The intramuscular injection of bile salts produces toxemia and even death, toxicity being directly proportional to the dose of the drug.

Bile injected into the peritoneal cavity possesses some specific toxic or devitalizing action apparently not dependent upon contained micro-organisms. Bile escaping into the peritoneal cavity from the gall bladder or extrahepatic biliary-duct system possesses the same characteristics. This specific toxic action is quantitative and appears to be due to the content of bile salt in the bile.

The remainder of the experimental work consisted in repetition of the experiments of Harkins, Harmon, Hudson, and Andrews, who contended that death in choleperitoneum was due to shock from loss of plasma-like fluid into the peritoneal cavity, and also an attempt to find effective treatment for the condition in experimental animals.

One hundred and forty c cm of sterile bovine bile containing 170 mgm of bile salt per cubic centimeter were injected intraperitoneally into 2 dogs. Blood-pressure tracings revealed an initial slight drop in the blood pressure, then a more gradual profound drop, and a final slow drop until death occurred four hours after the injection. During this period the hemoglobin rose to 120 per cent. At autopsy 250 c cm of darkly hemorrhagic fluid were found in the peritoneal cavity. In other experiments bile was permitted to flow into the peritoneal cavity from the gall bladder, and in still others bile salts were injected intravenously. The typical fall in the blood pressure ending in death occurred in all of these experimental animals. In the dogs having ascites from intraperitoneal bile irritation, there was a consistent elevation of the hemoglobin percentage due to hemoconcentration from loss of fluid. In the opinion of the authors, the loss of fluid into the peritoneal cavity was not sufficient in itself to cause death, but was an important contributing factor. A six per cent acacia solution administered intravenously prevented or delayed death in a sufficient number of animals to re-emphasize the fact that shock due to fluid loss was a factor in the causation of death from bile peritonitis. It also demonstrated that intravenously administered isotonic colloid solutions constituted a valuable therapeutic agent in this condition.

ARTHUR S W TOUROFF, M D

Sahci, L. Modifications of the Amino-Acid Curve in the Blood After the Complete Abstraction of Bile (Modificazioni nella curva amino-acidica dopo deviazione completa della bile). *Arch. ital. di mal. dell'appar. digerente*, 1938, 7: 334.

The author conducted a series of experiments with the purpose of studying the alterations in the deamin-

using power of the liver following the total abstraction of bile. He used dogs as experimental animals. Following laparotomy the common duct was isolated and a biliary fistula was produced through which the bile was draining freely.

The deaminizing power of the liver was studied by determining the amino acid level in the blood. The dogs were kept in a fasting state for about twelve hours after which time 7 c cm of blood were withdrawn. Immediately afterward 5 c cm of a 12 per cent solution of pure glycocholi were injected intravenously and the amino acid level in the blood was redetermined fifteen, thirty and sixty minutes following the injection. The amino acid nitrogen was determined according to Van Slyke's method. Subsequently the animals were operated upon and a biliary fistula was produced. The experiment was then repeated in the same order as outlined.

Saboi found that fifteen minutes after the intravenous injection of glycocholi into the normal fasting dog the amino acid level in the blood was decreased. The amino acid curve of the blood then began to rise gradually without however reaching the initial values. It was believed that this phenomenon was due to a sudden increase of the molecular concentration of the blood which was counteracted partly by the deaminizing power of the liver and partly by the absorption of glycocholi by the muscles which simultaneously released water into the blood.

In dogs with a biliary fistula however the amino acid curve did not show a fall following the injection of glycocholi on the contrary it had a tendency to rise. This rise persisted and became even more pronounced one hour after the injection of glycocholi. One month following surgical intervention the amino acid value of the blood showed irregular variations and had a tendency to be high.

This proves conclusively that the complete abstraction of bile definitely decreases the deaminizing power of the liver probably because of direct injury to the liver cells. As the result of this disturbance the detoxifying power of the liver is seriously impaired and death results if this function of the liver is completely abolished. RICHARD E. SOWNE, M.D.

Baxter H. Baxter S. G. and McIntosh J. F.
Variations in the Level of Serum Lipase in Experimental Pancreatitis. Am J Digest Dis
93:5 4-23

Ligation of the pancreatic ducts, division of the pancreas between ligatures and excision of the body of the pancreas are associated with the appearance of an olive oil splitting lipase in large amounts in the blood stream. The serum esterase however remains unaltered. Cherry and Crandall believe this to be evidence of the specificity of pancreatic lipase. The authors' experiments on dogs were done to determine the variation in serum lipase in the presence of experimental pancreatitis. Following the injection of bile into the major pancreatic duct there was a prompt rise in the serum lipase which usually reached a maximum in from twenty-four to forty-eight hours.

After reaching the peak it subsided abruptly at first and then more gradually until an approximately normal level was reached within from seven to ten days. The changes found at autopsy varied from a typical acute hemorrhagic pancreatitis with necrosis to a reaction so slight that eleven days after an injection of bile into the duct of Wirsung the only changes noted in the pancreas were focal areas of fibrosis and round cell infiltration. In 2 dogs that showed a high level of blood lipase following operation no significant changes were found in the pancreas at necropsy. An increase in the serum lipase occurs regularly in experimental pancreatitis and its estimation should prove valuable to the surgeon in diagnosing cases which show signs and symptoms suggestive of acute or subacute pancreatitis.

MANUEL E. LICHTENSTEIN, M.D.

Fraser Sir J. The Surgical Treatment of Obstructive Jaundice in Pancreatic Disease. *Brit J Surg* 1935 25:393

One thousand and thirty-five cases of obstructive jaundice following pancreatic disease form the basis of this review. All the cases under consideration represent obstructive jaundice secondary to chronic pancreatic disease.

The condition is more common in males than in females in the proportion of 2 to 1. The age of the patients ranged from thirty-four to eighty-two years; the largest number being between fifty-five and sixty-five years. This peak age incidence is common to both simple and malignant conditions.

Even at operation it may be difficult to establish the true nature of the morbid condition. Seven per cent of simple cases are mistakenly diagnosed as malignant while 16 per cent of the malignant cases are classified as simple.

The degree of jaundice may offer a clue to the diagnosis of the malignant case. The malignant type of pancreatic disease is the one which is associated with the more severe degrees of jaundice. An immediate direct Van den Bergh reaction is an infallible indication of the obstructive nature of the jaundice.

The pancreatic source of the obstruction may be established by (1) the sequence of the case history, (2) the character of the pain, and (3) the state of the gall bladder. In malignant disease nausea, anorexia, an early loss of weight and the appearance of cachexia are always present and always precede the development of the jaundice. If the lesion is simple however (jaundice is usually the first significant symptom). Pain was recorded in 54 per cent of the cases. In 12 per cent colic of a biliary type was present although no gall stones were found to exist. It is important to note that morphine did not relieve this colic but rather tended to aggravate it. Apart from the jaundice and the characteristic general appearance of the patient, distention of the gall bladder is an almost constant finding in malignant pancreatic disease.

X-ray investigation after a barium meal is of little or no value.

A knowledge of the degree of obstruction is afforded by the icteric index and serum bilirubin readings. The results of these tests aid in the prediction of the prognosis. The icteric index figures ranged from 18 to 262, and a reading above 150 was considered ominous. The serum bilirubin readings ranged from 2.5 to 14.6 mgm per cent, and it was agreed that any figure in excess of 5 mgm per cent was associated with definitely increased risks.

An estimate of the extent, site, and nature of the pancreatic disease may be reached by examination of the fat content of the stool. In pancreatic insufficiency the total fat of the stool is increased up to 70 or 80 per cent, the increase is found to be in the neutral fats and is the result of defective fat splitting. In pure obstructive jaundice, which does not imply interference with the external secretion of the pancreas, the total of fat is also increased but the increase is in the fatty-acid fraction, since the fat-splitting action is normal.

Sugar tolerance and blood-urea readings offer reliable information regarding the effects of the obstruction on the liver and renal functions. Since the essential lethality of the condition of obstructive jaundice is related to a sequence of events which culminates in one or the other of two disasters—liver or renal dysfunction—these tests are of great value.

Blood-coagulation readings yield uncertain results, and are of doubtful value.

There is a diversity of opinion as to the advisability of operation for obstructive jaundice arising from pancreatic disease, but the overwhelming majority of workers favors operation. Of the various types of operation, internal drainage or an anastomosis procedure is most favored, and cholecystogastrostomy is the choice in 45 per cent of the cases. The operative mortality figures are (1) for all classes of cases, 40.1 per cent, (2) in malignant disease of the pancreas, 51.84 per cent, and (3) in chronic pancreatitis 19.8 per cent. There is an association between the grade of jaundice and the mortality rate. Cholemia is given as the most common cause of death. This clinical syndrome is recognized as the development associated with the fatal issue in the greatest number of cases. In it there are present a rising temperature, vomiting, loss of consciousness, and anuria. Its effects are exerted about the fifth day, and its development appears to be related to the sudden decompression of the biliary system. If some method could be evolved which gave more gradual relief of pressure the immediate results might be improved.

White bile was found in 4.4 per cent of the cases, with an associated mortality of 82.5 per cent. Whether it is an evidence of sepsis and the result of a removal of bile pigment by leucocytes, or whether it is an evidence of hepatic suppression, it is, in a clinical sense, a most ominous sign.

A study of the survival period following operation for malignant disease of the pancreas shows that 90 per cent of the patients die within the first year, but during life a large percentage enjoy freedom from pain, jaundice, and pruritus.

A similar analysis in chronic pancreatitis shows that 60 per cent of the patients are alive at varying periods exceeding one year after operation, and are enjoying relatively good health. When relapses occur they are apt to be associated with previous operations of the surface-drainage type.

The review of these cases seems to offer two suggestions: (1) operation should be performed early before liver and kidney function is seriously impaired, and (2) in cases of severe jaundice, a two-stage method should be used for the purpose of diminishing the risks of sudden biliary decompression.

SAMUEL KAHN, M.D.

MISCELLANEOUS

Schockaert, J. A., Rosman, J. P., and Nolens, H.
The Sedimentation Rate as a Diagnostic Aid in the Differential Diagnosis of Acute Adnexal Diseases, Appendicitis, and Extra-Uterine Pregnancy (La sédimentation globulaire comme élément de diagnostic différentiel dans les annexites aiguës, les appendicites et la grossesse extra-utérine) *Bruxelles-méd.*, 1938, 18, 1334.

The authors are strongly convinced of the value of the determination of the sedimentation rate of the blood in the differential diagnosis of certain gynecological syndromes which may be easily confused. They point out that in acute adnexal disease, various types of appendicitis, and extra-uterine pregnancy and its complications the temperature and pulse findings often follow no standard, that the leucocyte count may be deceiving, being either inordinately high or comfortingly low, and that even the best history and physical examination may only further the clinician's perplexity.

With a review of their own and other cases, they show that in acute adnexal infections the speed of the sedimentation is greatly accelerated in a large majority of cases, and that in acute appendicitis it is also raised, but the rate is not nearly so high. In 95 per cent of all cases the sedimentation rate makes possible a differential diagnosis between these two disease entities, this is important for the patient, of course, since the treatment of the former is non-surgical, and of the latter, always surgical. These workers found the average sedimentation rate in acute adnexal disease to be 50.1 mm after one hour and 81.4 mm after two hours, while for appendicitis it averaged in all cases well under 20 mm for the first hour, and over 50 mm only once in 101 cases. They recommend, therefore, that if the sedimentation has proceeded past 20 mm during the first hour, surgery may be safely shelved, at least temporarily, and the patient should be put to bed and treated for adnexal disease.

In tubal pregnancies the sedimentation rate varies considerably, according to whether the lesion is a simple tubal pregnancy, an encysted hematocoele, or an actual hemoperitoneum. In 12 cases of verified encysted hematocoele the average sedimentation rate was 18.8 mm after the first hour and 41.6 mm after the second hour, which allows a margin of some

diagnostic value when matched with the findings of acute appendicitis

The authors admit however that the differential diagnosis between acute adnexal infections and the presence of free blood in the pelvic cavity as after the rupture of a tubal pregnancy is not made possible by a study of the sedimentation rate. Diagnosis then must depend on the history and manual examination

JOHN MARTIN M.D.

Moncalvi L. The Syndrome of Abdominothoracic Lesions and Its Importance for Emergency Surgery (*Interferenze sindromi ed affezioni addomino toraciche nella chirurgia d'urgenza*) *Arch Ital di chir* 1938 49:1

The knowledge of the abdominothoracic syndrome is of great importance for every surgeon because many pathological conditions of the thoracic organs may simulate surgical diseases of the abdomen and vice versa. Either the pathological process may spread by contiguity or certain reflexes may be responsible for the confusion because numerous anastomoses between the cerebrospinal and the sympathetic system offer infinite possibilities of various combinations of symptoms

Traumas may involve the thorax and the abdomen causing on the one hand an emphysema, subcutaneous emphysema, hemopneumothorax and hemopericardium and on the other hand pains in the abdomen, hemoperitoneum, pneumoperitoneum and hematuria. An exploratory laparotomy should be followed by an aspiration of the hemothorax.

A congenital or acquired spontaneous or traumatic hernia may produce dyspnea, borborygmi, abnormal percussion sounds over the thorax, abdominal pains, digestive disturbances and vomiting. A roentgenographic examination after an opaque meal or pneumoperitoneum is essential.

A subphrenic abscess may produce intercostal pains, dyspnea, an abnormal distention of one half of the chest and dullness on percussion as well as vomiting, meteorism and descent of the lower hepatic border.

In addition to the well known abdominal symptoms such as pain in the epigastrium and tympanites, a perforation of a gastric or duodenal ulcer may cause thoracic signs viz. cyanosis, tachycardia, dyspnea and limitation of respiratory movements.

Inflammation of a subhepatic or retrocolic appendix may produce in addition to pains in the right upper quadrant of the abdomen, pains in the chest, limitation of the respiratory movements and dullness over the base of the right lung. A concomitant pneumonic focus, a bronchopneumonia, involvement of a valvular endocarditis in the course of a peritonitis should not be overlooked. Vague abdominal pains combined with right, left or bilateral serous pleurisy or pericarditis suggest polyserositis. For a high pericardiolysis or cardio omentopexy may be considered.

Among chest conditions it is possible for an abdominal symptomatology, pneumonia and basal diaphragmatic or mediastinal pleurisy must be mentioned in addition to the typical signs they may cause acute pains in the epigastrium or hypochondrium and vomiting thus simulating an appendicitis. Furthermore, angina pectoris caused by an aortitis or a coronary sclerosis may lead to an arrhythmia, precordial pain, bradycardia and typical angina attacks as well as to digestive disturbances and abdominal pains.

An infarct of the myocardium or a rupture of the aorta within the endopericardium is known to have caused precordial pain, arrhythmia, tachycardia, dyspnea and cyanosis in addition to sharp epigastric pains, vomiting and other abdominal symptoms.

JOSEPH K. NARAT M.D.

GYNECOLOGY

UTERUS

Delmas, P The Uterus Considered as One of the Cavities of the Organism (De l'utérus considéré comme une des cavités de l'organisme) *Rev franç de gynec et d'obst*, 1938, 33 513

Delmas notes that in the adult animal organism there are multiple cavities, which originate by two methods. Cavities of the first group are formed by fission, these include the serous cavities and the more highly differentiated circulatory organs. Cavities of the second group are formed by invagination, as all the organs of this type originate in a small depression between the layers of the primitive embryo. To this group belong the digestive organs and the uterus. In the female embryo, the wolffian duct atrophies and the two Mueller's ducts originate from it. The two ducts remain separate in their upper portion to form the fallopian tubes, but unite in the lower portion to form the uterus and the vagina.

The essential structure of the uterus, resulting from this embryological development, consists in the epithelial lining and the muscular wall, the latter has two layers: the external layer is a continuation of the longitudinal fibers of the fallopian tubes, the internal layer a continuation of the circular fibers. The external serous covering results from the presence of the uterus in the peritoneal cavity.

The uterine cavity is triangular in shape, with the base of the triangle above. During the first three months of pregnancy, with the growth of the embryo, it becomes rounded, during the second three months the uterus is molded around the fetus, and tends to become ovoid, and during the last three months the head of the fetus turns toward the isthmus.

The mucosa of the uterus is modified for the nidation of the ovum, and during pregnancy a vascular network between the two muscular layers is much hypertrophied to insure a sufficient blood supply to the developing fetus. When the time of delivery comes, the uterus is also the "agent of expulsion", in this the cervix plays a part on account of its muscular structure. The mucosa of the cervix, however, does not undergo any alteration during pregnancy.

Alice M. Meylrs

Villata, I Leucemic Infiltration of the Uterus (Infiltrazione leucemica dell'utero) *Riv ital di gynec*, 1938, 21 287

Leucemic infiltration of the genital organs, and especially of the uterus, is rather rare and little known. However, this rarity is probably due to the fact that anatomicopathological search for the typical changes has not been extended to the uterus because it seldom shows macroscopic alterations. The author reports 2 cases in women aged fifty-four and eighteen years, respectively, in whom he found leucemic infiltrations of the uterus at autopsy.

In the first case, the clinical data and the blood and anatomicopathological findings did not leave any doubt as to the diagnosis of leucemic lymphadenosis. Attention was called to the morphological aspect of the uterus, the enlargement of which did not seem to be justified by the previous pregnancies nor by any inflammatory or neoplastic process. Vertical section showed that the tissues of the organ were of a homogeneous grayish-white color. Histological examination revealed numerous elements of lymphocytic type in the three coats of the uterus, but excluded the possibility of an inflammatory process, tuberculosis, myometritis, or small-cell sarcoma. The findings in the other organs (liver, spleen, lymph nodes, and bone marrow) and the diagnosis made while the patient was still alive showed that the uterine changes were leucemic lesions.

In the second case, the diagnosis of leucemic lymphadenosis was also evident, but at autopsy attention was not called to the uterus, which was found to be enlarged only after its diameters had been measured and its weight verified, and both measurements had been compared to those of the normal uterus of women of the same age. Even the color of the myometrium and its consistency were only slightly changed and did not justify the macroscopic diagnosis of leucemic infiltration. However, the author's suspicion having been aroused by the findings in the first case, he proceeded to the histological examination of this uterus and discovered that the infiltration by leucemic elements was much more pronounced than was suggested by the macroscopic aspect of the organ: not only the myometrium but also the mucosa was infiltrated.

In both cases, the infiltration was too intense to permit determination of whether it had started from the perivascular tissues. In the search for signs of leucemic infiltration of the uterus, the increase in volume, the homogeneous whitish color of the surface upon section, the slight change in consistency, and the swelling of the mucosa should be kept in mind. Undoubtedly, leucemic involvement of the uterus is more frequent than is expected in the forms of lymphadenosis or leucemic and aleucemic myelosis and may lead eventually to functional disturbances. Whether it is more frequent in multiparas than in nulliparas remains an open question.

RICHARD KEMEL, M.D.

Miller, N. F., and Folsome, C. E. Carcinoma of the Cervix. *Am J Obst & Gynec*, 1938, 36 545

A total of 1,026 patients with carcinoma have been studied, of these, 676 had carcinoma of the cervix. Seventy-six per cent of the patients were treated with combined x-ray and radium therapy. Ten per cent of the patients, or those with advanced lesions, received x-ray therapy only, 11 per cent were treated

by other methods or combinations of methods and 3 per cent received no treatment of any kind. In general deep x ray therapy preceded the radium application to the cervix and adjacent structures.

In 1936 14 cases of hip fracture among patients treated in this clinic were reported. The authors have now seen a total of 35 proved fractures and many more probable fractures. Twenty five of the proved fractures occurred in the group of patients with cervical cancer.

The five year and six year survival rates were practically the same namely 24.42 and 23.66 per cent respectively.

The authors offer the following clinical classification of cervical cancers.

Group I Any early proved lesion involving not more than one lip of the cervix or its equivalent.

Group II Any proved lesion more extensive than Group I up to complete involvement of the cervix but with no parametrial thickening.

Group III Group II cases with questionable parametrial thickening.

Group IV (a) All lesions with definite parametrial thickening or definite bladder bowel or vaginal involvement. (b) Lesions presenting a frozen pelvis with or without remote metastasis. (c) Lesions with fistula (for statistical and classifying purposes).

In the discussion ANSPACK stated that it was his belief that the operative treatment of cervical cancer will disappear. If radium is successful occasionally in the advanced case why not frequently in the early ones? In his series of cases in Class I there was a 100 per cent salvage at the end of five years.

Nicholson said he could not allow one statement of the authors to pass without definite criticism. This was in regard to the value of treatment of lesions of the cervix. A small proportion of early carcinomas of the cervix may be cured unknowingly by the skillful use of the cautery at a stage when as far as can be seen the lesion is nothing more than an erosion. Furthermore Nicholson is still willing to consider them as tending to develop into cancer. It is a very grave mistake to say at this period of our knowledge of cancer that the presence of cervical erosion has no bearing upon the later incidence of carcinoma.

EDWARD L. CORNELL M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Varangor J. Ovarian Tumors of Brenner's Type (*Les tumeurs ovariennes du type Brenner*) *Ginec et obst.* 1938 18 94.

The author collected from the literature 105 cases of Brenner's tumor in addition to his 3. The tumors occur most frequently at the time of the menopause or following it and are exceptional in young girls. The symptoms are created essentially by the size of the tumors which if small are discovered only accidentally in the course of operations performed for other reasons. When the tumors are large they cause the customary pressure symptoms and are

characterized by the absence of secretion of the estrogenic hormone. Clinically the tumors behave like benign neoplasm and local recurrences or metastases have never been observed. On inspection with the naked eye they have the appearance of an ovarian fibroma suggesting a simple oophorectomy. This type of intervention is justified because the tumors are always benign. The histological examination allows the differentiation of Brenner tumors from malignant varieties of ovarian neoplasm. Recognition of the character of the tumors is important because radiotherapy in such cases is superfluous.

According to one hypothesis Brenner's tumors derive from Walthard's islets which originate from the endothelium of the celom. The relative frequency of Brenner's tumors and the rarity of Walthard's islets in the ovaries militate against this theory. Nevertheless clusters of paramephalial epithelium cells identical with non-differentiated Walthard's islets exist on the surface of the tubes and the broad ligaments and represent miniature Brenner's tumors. It is surprising that a voluminous Brenner's tumor has never been found in the tubes broad ligament or mesosalpinx.

Schüller advanced another theory according to which Brenner's tumors are of a wolffian origin. An inclusion in the gonads of cells primarily belonging to the urinary system may be responsible for the formation of such tumors. JOSEPH F. NARAY M.D.

MISCELLANEOUS

Béclère C. The Clinical and Physiological Basis of Functional Uterine Hemorrhages Caused by Ovarian Hormonal Dysfunction (*Bases cliniques et physiologiques des hémorragies utérines fonctionnelles par trouble hormonal ovarien*) *Bull Soc de gynéc et obst.* de Paris 1938 27 405.

In his clinical studies of functional uterine hemorrhage Béclère has found that the normal menopause may cause a spontaneous cure of uterine hemorrhage that has persisted for many years a fact which indicates a close relationship between abnormal functional bleeding and normal menstrual bleeding. Premenopausal uterine hemorrhages show three distinctive characteristics in two third of the cases (1) sudden derangement of the normal menstrual periods in a woman who has previously menstruated normally, (2) complete disappearance of the normal menstrual bleeding which is replaced by irregular menometrorrhagia but with a free interval of from one to three weeks between these abnormal hemorrhages and finally (3) a phase of amenorrhea alternating with phase of bleeding. The fact that there are periods of amenorrhea indicates that there is a disturbance of ovarian function not purely uterine in origin. In 10 per cent of the cases there is only menorrhagia with a normal periodicity. In another 10 per cent of the cases there is only a polymenorrhea the menstrual cycle being suddenly altered and shortened.

There are also intermediary stages between the normal menopause and abnormal functional hemorrhage before the menopause the menopause may occur in stages with phases of amenorrhea alternating with normal menstrual periods. It may also occur by derangement of the menstrual cycle and loss of the normal rhythm, but with a normal duration and amount of flow at the menstrual period. All these facts indicate the close relation between normal menstruation and abnormal uterine bleeding of the functional type.

Clinically it has been demonstrated that surgical removal of the ovaries or suppression of the functional activity of the ovaries by roentgen-ray irradiation is sufficient to cause cessation of both the abnormal hemorrhages and the normal menstrual periods, if the abnormal bleeding is functional. In such cases no intra-uterine treatment is necessary to control the bleeding. Histological examination of the ovary in practically every case of functional uterine bleeding shows persistent cystic follicles and no corpus luteum. The uterine mucosa shows benign glandular hyperplasia in the majority of cases. Hysterography shows abnormal notching of the uterine outline, caused by abnormal hypertrophy of the mucosa from disturbed ovarian function.

In some cases Zondek has shown an excess of folliculin in the blood and in the urine of women with functional hemorrhages. Experimentally, Kaufmann has produced a benign glandular hyperplasia of the uterine mucosa in castrated women by the administration of large doses of folliculin. All these findings indicate that the glandular hyperplasia and functional hemorrhage are due to abnormal exaggeration of a normal phase of the menstrual cycle caused by increased stimulation by the persistent cystic follicles.

When one ovary or all but a small portion of both ovaries is removed in very young animals, symptoms do not develop at once, but only when the animal reaches the age of puberty. If this same operation is done in an adult animal symptoms develop at once. In analyzing these experimental

results, Lipschuetz concludes that when only a small amount of normal ovarian tissue is left *in situ* it is not sufficient to inhibit the hormones of the anterior lobe of the pituitary gland, and the excessive secretion results in the formation of cystic follicles and the derangement of the normal balance between the follicular and corpus-luteum hormones.

In women with functional uterine hemorrhage the ovaries have been injured by congenital lesions or by acquired lesions due to the approach of the menopause. This injury results in excess functional activity of the anterior lobe of the pituitary gland, the formation of persistent cystic follicles, and the absence or degeneration of the corpus luteum.

These experimental findings have been confirmed in several of the author's cases. In cases in which one ovary was removed because of infection, functional uterine hemorrhages developed within a few months or later in women who previously menstruated normally. In some of these cases hysterography showed the characteristic notched appearance, in others, subsequent operation showed cystic follicles in the remaining ovary.

In women the best method of inhibiting excessive secretion of the anterior lobe of the pituitary gland without stimulation of the ovary is the injection of the male hormone. The author has recently used testosterone propionate in his cases of functional uterine hemorrhage, he has not yet treated a sufficient number of cases for statistical analysis, but his results have been encouraging.

In the discussion, Bécclère stated that in all his cases of uterine hemorrhage, biopsy studies are made of the material obtained by curettage, repeated studies are made whenever possible. At the Saint Antoine Hospital, Paris, more than 300 cases of uterine hemorrhage in women of all ages have been studied both by hysterosalpingography and by curettage and biopsy. In all cases in which the uterine image was abnormal, a curettage for biopsy was done. Bécclère thus has a large number of records on which his study of functional uterine hemorrhage is based.

Alice M. Meyers

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EDWARD L. CORNELL, M.D.

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characterized by the absence of secretion of the estrogenic hormone. Clinically the tumors behave like benign neoplasm and local recurrences or metastases have never been observed. On inspection with the naked eye they have the appearance of an ovarian fibroma suggesting a simple oophorectomy. This type of intervention is justified because the tumors are always benign. The histological examination allows the differentiation of Brenner's tumors from malignant varieties of ovarian neoplasms. Recognition of the character of the tumors is important because radiotherapy in such cases is superfluous.

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In his clinical studies of functional uterine hemorrhage Beclère has found that the normal menopause may cause a spontaneous cure of uterine hemorrhage that has persisted for many years a fact which indicates a close relationship between abnormal functional bleeding and normal menstrual bleeding. Pre-menopausal uterine hemorrhages show three distinctive characteristics in two third of the cases: (1) sudden derangement of the normal menstrual period in a woman who has previously menstruated normally; (2) complete disappearance of the normal menstrual bleeding which is replaced by irregular menometrorrhagia but with a free interval of from one to three weeks between the abnormal hemorrhage and finally (3) a phase of amenorrhea alternating with phases of bleeding. The fact that there are periods of amenorrhea indicates that there is a disturbance of ovarian function, not purely uterine. In 10 per cent of the cases there is only menorrhagia with a normal periodicity. In another 10 per cent of the cases there is only a polymenorrhea the menstrual cycle being suddenly altered and shortened.

3 Apparent clinical improvement, such as cessation of the vomiting and ability to retain food, in the presence of persistent tachycardia, elevated temperature, and persistent urinary abnormalities, should not be considered as a sign of the patient's improvement. In 6 of the 15 fatal cases, it was shown that the patients had retained food for some time before death.

4 Listlessness, stupor, involuntary urination and defecation, and periods of irrationality are frequently evidence that the toxemia will result fatally, whatever the treatment.

5 Cervical packs and bags should not be used in cases in which therapeutic abortion is to be done. If the cervix is not easily dilatable, vaginal hysterotomy should be performed, so that the uterus may be emptied promptly.

There were 32 therapeutic abortions in this series of 396 cases of hyperemesis. Death occurred in 15 cases. Color, age, parity, and the marital state seem to have no influence on the course of the disease. Persistent tachycardia, fever, diacetic acid, and acetone are danger signals. The ability of patients who are seriously ill to retain food and fluids is not necessarily a sign of improvement.

The majority of the patients in this group responded promptly to rest, diet, glucose therapy, and fluids. Abortion should be done in the cases of those who fail to respond to adequate treatment in a reasonable length of time. Therapeutic abortions delayed too long are not life-saving measures.

Death from hyperemesis is avoidable.

EDWARD L. CORNELL, M.D.

Holtz, F. The Treatment of Abortion (*Le traitement de l'avortement*). *Acta obst. et gynec. Scand.*, 1938, 18, 245.

Holtz reports a study of the results of different methods of treatment of abortion as carried out in three obstetrical clinics in Stockholm, Sweden. He distinguishes abortions in the first three months from abortions or premature births in from the fourth to the seventh months, there were 1,583 cases in the first group and 1,135 cases in the second group. In abortions in the first three months active treatment consisted in the prompt emptying of the uterus by means of Saenger's forceps and curettage. In 374 febrile cases without severe hemorrhage treated by this method there were no deaths, and extension of the infection occurred in only 6 cases or 1.6 per cent. In 215 non-febrile cases treated actively there was extension of the infection in only 1 case or 0.5 per cent. In 366 febrile cases treated conservatively (without curettage) there were 4 deaths, and 33 cases (9 per cent) with extension of the infection, in 198 non-febrile cases treated conservatively there were no deaths, but extension of the infection occurred in 3 cases (1.5 per cent) and endometritis in 7 cases (3.5 per cent). In 82 cases curettage was done after prolonged conservative treatment, in these cases there were 2 deaths (2.4 per cent) and 4 cases with extension of the infection (4.9 per cent).

Secondary anemia occurred more frequently in the cases treated conservatively than in those treated actively—in 22 per cent of the febrile cases and in 26 per cent of the non-febrile cases treated conservatively, and in only 2 or 0.5 per cent of the febrile cases treated actively and in none of the non-febrile cases treated actively. Active treatment (curettage) evidently gives definitely better results than conservative treatment in abortion in the first three months not complicated by severe hemorrhage. In cases with hemorrhage, curettage does not give quite as good results, for in 122 febrile cases with hemorrhage there was 1 death (0.8 per cent) and extension of the infection in 2 cases (1.6 per cent), and in 66 non-febrile cases, there was extension of the infection in 3 or 4.5 per cent, but no deaths. The incidence of secondary anemia is much higher in cases with hemorrhage, as would be expected, in this series it occurred in 22.1 per cent of the febrile and 28.8 per cent of the non-febrile cases. However, in the presence of severe hemorrhage, curettage is necessary to prevent further bleeding.

In a follow-up study of patients at least four years after the abortion, it was found that conservative treatment was followed by sterility more frequently than active treatment, and that tubal pregnancy also occurred more often after conservative treatment. Active treatment therefore gives definitely better results in non-complicated cases of abortion in the first three months than conservative treatment.

In most of the cases of abortion in the later months, both the fetus and the placenta were expelled spontaneously with or without the aid of oxytocics. It is only in cases with retention of the placenta that the question of the need for intervention arises. In non-febrile cases there were no deaths and no extension of the infection with either conservative or active treatment, with conservative treatment, however, 83 per cent of the patients developed endometritis and 11.1 per cent, secondary anemia, while neither of these complications developed in non-febrile cases treated actively. In febrile cases, the mortality was essentially the same in the cases treated conservatively and in those treated actively (1 death in 60 and 61 cases, respectively), but endometritis, extension of the infection, and secondary anemia occurred with greater frequency in the cases treated conservatively. The period of hospitalization was also longer in the latter group than in those treated actively. In the follow-up of patients four years or more after abortion in the later months of pregnancy, it was found that active treatment in cases of retention of the placenta gave equally good late results as conservative treatment in cases without retention of the placenta.

In cases in which the infection has already extended beyond the uterus when the patient is first seen, when such complications as salpingitis, peritonitis, or septicemia are present, there is general agreement that conservative treatment is indicated.

Alice M. Meyers

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Dieckmann W J Michel H L and Woodruff P W The Cold Pressor Test in Pregnancy
Am J Obst & Gynec 1938 36 408

The cold pressor test was used in 152 normal pregnant women

An increase in the systolic pressure of 30 mm or more was considered abnormal

Ninety patients were hyperreactors 15 developed toxemia and an additional 13 had transient abnormal vascular renal signs

Sixty two patients gave a normal response to the test Only 2 developed toxemia and an additional 5 had transient signs

The cold pressor test was then compared with the pituitrin test The abnormal reaction of the former in a pregnant woman seemed to indicate that she might develop a toxemia in which hypertension would be the predominant finding An abnormal pituitrin reaction commonly occurred in patients with toxemia of the pre eclamptic type

Repeated ice water tests which were made on the same day in 5 patients precipitated alarming vascular renal symptoms and signs

EDWARD L CORNELL M D

Cotte G and Magnin P Pregnancies Following Myomectomies (*Les grossesses consécutives aux myomectomies*) *Gynec et obst* 1938 38 5

Wilking to determine the number of pregnancies that have occurred in their myomectomized patients during the past ten years the authors sent a questionnaire to those who had not yet reached the age of forty one years at the time of the intervention They received an adequate answer from 59 but 26 of these had to be eliminated because for various reasons the possibility of pregnancy was out of the question in their cases Of the 33 remaining women whose genital organs could be considered normal 10 or 30 per cent had had one or more pregnancies 2 of these had aborted and 8 had gone to term without incident Five had had 1 pregnancy 2 had had 2 and 1 had had 3 pregnancies There was no marked difference as to the location and volume of the myomas between the women who became pregnant after myomectomy and those who did not become pregnant but the pregnancies were much more frequent in women who had not yet reached the age of thirty five years As in half of the case an interval of at least two years had elapsed between the intervention and the pregnancy the percentage of women who had had pregnancies would rise to 40 if the necessary correction were made There is also the problem of voluntary sterility

From the point of view of future pregnancy the absolute necessity of complete covering of the myomectomized pocket when in the vicinity of the uterine

corners should be remembered while angulation or obliteration of the interstitial portion of the tube must be avoided

Two of the patients who had been married several years became pregnant for the first time after myomectomy unfortunately 1 aborted On the other hand 8 married women whose adnexa appeared to be normal remained sterile Consequently it would seem that the presence of myomas in a sterile woman cannot be regarded *a priori* as the cause of this sterility Among 7 women who went to term 3 had had only miscarriages before the intervention in these cases it is allowable to suppose that the myomas were the cause of the interruption of the previous pregnancies However it would be wise after myomectomy to institute such specific or hormonal treatment as might be indicated by laboratory or clinical findings in these cases The bogey of dystocia after myomectomy should be dispelled because pregnancy and delivery take place in the normal manner after this intervention

The statistics of Nystrom and of Gouilloud as well as those of Haupt and of Hamant on pregnancy after myomectomy show that the figures given in the global statistics of Massabiau and Guibal (6 per cent) and of Boehler (10 per cent) tend to give a wrong impression only cases in which pregnancy is possible should be used to establish the percentages while single women those too old to become pregnant and those having adnexal lesions should be excluded This will give a minimum of one third of the patients who are apt to have one or more pregnancies With all the other advantages offered by myomectomy it must be admitted that this intervention is the treatment of choice in case of myoma and that hysterectomy should be considered only when conservation is absolutely impossible

RICHARD KENZEL, M D

Fitzgerald J E and Webster A Hyperemesis Gravidarum *Am J Obst & Gynec* 1938 36 460

Consideration of a large number of cases of hyperemesis gravidarum reveals that they may be placed in two groups for prognostic study Patients in the first group improve readily often with no treatment except that of rest and isolation and the life of the patient is never in danger Those in the second and smaller group respond slowly to treatment and a few of them die A study of the fatal cases in this series indicates that a certain number of deaths might have been prevented and that in the future such deaths may be prevented by close attention to the following general principles

1 So called cured patients should be kept under close observation

2 The lack of clinical improvement regardless of laboratory findings should be regarded as an unfavorable prognostic factor

Apart from attention to the general health and any special indications of disease, the antenatal prevention of puerperal infection involves the treatment of septic foci in the body, for example, teeth, tonsils, and the cervix uteri

Intranasal technique is the most important point of all, for it is during labor that the danger is at its maximum. The simple main requirements are a clean vulva, clean hands, clean dressings, clean instruments, and the prevention of their contamination during the labor.

In the early days of the puerperium similar precautions must be maintained, for there is abundant evidence that some women become infected a day or two after delivery. The main principle is the prevention of infection from the hands, nose, and throat of the nurse or others attending the patient, and to this must now be added the prevention of contagion, air-borne or otherwise, from one of the patients to the others.

The sphere of drugs in the prophylaxis of infection in the puerperium has received attention from time to time. The recent introduction of sulfanilamide preparations and their striking success in the therapeutic treatment of streptococcal infections naturally raised the question whether their administration would be correspondingly successful in prophylaxis. In our experience their administration was apparently beneficial and was seldom, if ever, associated with any harmful effects.

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The term puerperal pyemia applies to an infection which, having invaded the blood stream, has caused a form of endophlebitis with thrombus formation in one or more veins and suppuration of the thrombus, which periodically discharges infecting material into the blood stream. Evidently, this pyemia can be caused only by bacteria of low virulence, as otherwise the symptoms would be totally different. Consequently, real pyemia is in theory a chronic process and must be rather rare because various conditions must concur to keep it for a relatively long time within its stated limits. For obvious reasons, puerperal pyemia rarely occurs in clinics and in maternity institutes, practically all cases originate in women who have been infected at home before admission to a clinic. This finding naturally also applies to pyemia following criminal abortion.

In true pyemia, the treatment may change from medical to surgical when the presence of hard, somewhat painful cords, located in the base of the broad ligament or in the vicinity of the tubes, indicates the seat of the thrombophlebotic process. The blood findings in connection with the chills will confirm the diagnosis and indicate the opportunity for the surgical intervention. The question of early or late intervention must be decided on the merits of the case, but ligation of the veins must always be as complete as possible and be applied to the internal iliac, or to the common iliac, and the spermatic veins if it is undesirable to ligate the inferior vena cava. The most favorable route for the individual case, whether the transperitoneal or the extra-peritoneal, should be selected for the intervention.

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Aftercoming head forceps should always be used after the head has become engaged

Of 38 cesarean sections 40 were done because of fetopelvic disproportion with a breech presentation and the 18 others were done because of some accident of pregnancy in addition to a breech presentation Among the 8 babies who died there was 1 with a large breech which was the sole indication for the type of delivery chosen The 7 other babies died because of other accidents of pregnancy such as placenta previa and premature separation of the placenta

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PUERPERIUM AND ITS COMPLICATIONS

Johnstone R W The Prevention and Control of Puerperal Sepsis *Brit M J* 1938 1 331

There is no question that conditions in regard to puerperal infection have improved considerably during the present generation but we are far from having reached the irreducible minimum in its incidence What we have achieved is a fairly complete understanding of its causes We know something about the conditions upon which the patient's resistance depends and that toxemia hemorrhage exhaustion and malnutrition decrease it We know that trauma and hemorrhage diminish the local resistance of the tissues we know the common sources of the most dangerous organisms and we have learned a good deal regarding the methods of preventing their access

There are two types of infecting organism First the organisms commonly found in the skin of and around the vulva on the hands and clothes and on unsterilized dressings and instruments—for the most part anaerobic and non hemolytic streptococci staphylococci and coliform organisms These organisms most commonly give rise to infection after labors in which there has been considerable injury of the tissues They cause a true wound infection and our methods to combat them are essentially the same as those adopted in surgery Secondly there is the hemolytic streptococcus associated with scarlet fever and erysipelas but most commonly with tonsillitis nasal infections and morbid conditions of the upper air passages generally This organism is the cause of many puerperal infections and of the vast majority of the fatal cases Not only is this type of infection more deadly to the individual patient but as often as not it attacks the woman who has had a normal spontaneous delivery Among recently delivered women it appears to have a degree of contagiousness comparable only to that of smallpox This organism is practically never present in the birth canal before labor but is conveyed from without and usually by droplet or spray infection from the nose or throat of one or more of those in attendance at the delivery or during the puerperium not including the patient herself

In the last two years there have been 2 cases in England in which a patient who went into a small maternity hospital or home for her delivery and there contracted puerperal infection has successfully claimed damages from the hospital authorities or doctor concerned because of alleged lack of reasonable care against infection

Apart from attention to the general health and any special indications of disease, the antenatal prevention of puerperal infection involves the treatment of septic foci in the body, for example, teeth, tonsils, and the cervix uteri.

Intranasal technique is the most important point of all, for it is during labor that the danger is at its maximum. The simple main requirements are a clean vulva, clean hands, clean dressings, clean instruments, and the prevention of their contamination during the labor.

In the early days of the puerperium similar precautions must be maintained, for there is abundant evidence that some women become infected a day or two after delivery. The main principle is the prevention of infection from the hands, nose, and throat of the nurse or others attending the patient, and to this must now be added the prevention of contagion, air-borne or otherwise, from one of the patients to the others.

The sphere of drugs in the prophylaxis of infection in the puerperium has received attention from time to time. The recent introduction of sulfanilamide preparations and their striking success in the therapeutic treatment of streptococcal infections naturally raised the question whether their administration would be correspondingly successful in prophylaxis. In our experience their administration was apparently beneficial and was seldom, if ever, associated with any harmful effects.

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PUERPERIUM AND ITS COMPLICATIONS

Johnstone R W The Prevention and Control of Puerperal Sepsis *Brit M J* 1938 2 331

There is no question that conditions in regard to puerperal infection have improved considerably during the present generation but we are far from having reached the irreducible minimum in its incidence What we have achieved is a fairly complete understanding of its causes We know something about the conditions upon which the patient's resistance depends and that toxemia hemorrhage exhaustion and malnutrition decrease it We know that trauma and hemorrhage diminish the local resistance of the tissues we know the common sources of the most dangerous organisms and we have learned a good deal regarding the methods of preventing their access

There are two types of infecting organism First the organisms commonly found in the skin of and around the vulva on the hands and clothes and on unsterilized dressings and instruments—for the most part anaerobic and non hemolytic streptococci staphylococci and coliform organisms These organisms most commonly give rise to infection after labors in which there has been considerable injury of the tissues They cause a true wound infection and our methods to combat them are essentially the same as those adopted in surgery Secondly there is the hemolytic streptococcus associated with scarlet fever and erysipelas but most commonly with tonsillitis nasal infections and morbid conditions of the upper air passages generally This organism is the cause of many puerperal infections and of the vast majority of the fatal cases Not only is this type of infection more deadly to the individual patient but as often as not it attacks the woman who has had a normal spontaneous delivery Among recently delivered women it appears to have a degree of contagiousness comparable only to that of smallpox This organism is practically never present in the birth canal before labor but is conveyed from without and usually by droplet or spray infection from the nose or throat of one or more of those in attendance at the delivery or during the puerperium not including the patient herself

In the last two years there have been 2 cases in England in which a patient who went into a small maternity hospital or home for her delivery and there contracted puerperal infection has successfully claimed damages from the hospital authorities or doctor concerned because of alleged lack of reasonable care against infection

CARCINOMA OF THE PROSTATE

Collective Review

THEOPHIL P GRAUER, M D , Chicago, Illinois

PROSTATIC cancer is one of the most common conditions found in urological practice. Its treatment is a subject of considerable controversy among urologists and those interested in radiotherapy. The disease still remains resistant to practically all known methods which have been designed for its cure. Most modes of therapy are simply attempts to combat distressing symptoms and postpone the time of death, but always with the hope of producing a cure.

Caulk reports that 4 per cent of all deaths from cancer in the male result from carcinoma of the prostate, and of every 1,000 deaths in the male, 6 are due to it. Most of the authors agree pretty well that nearly 20 per cent of all patients suffering from prostatic conditions have cancer of the prostate, also almost universally they stress the fact that our best hopes lie in "early" diagnosis and treatment.

In this connection Keyes says that opinions may still differ as to the exact definition of "early" cancer of the prostate. The disease surely exists in the gland for an appreciable interval of time before it is palpable by rectal touch. At the early stage of the disease we are able to cure it almost as a matter of course, that is, if it is still confined to a hypertrophied portion of the gland and the patient is fortunate enough to submit to prostatectomy for relief. If the carcinoma is still so small as not to have established any extension to the remainder of the gland, it comes out with the adenoma, its presence unsuspected until revealed by pathological section.

Young advocates the exploration of suspicious nodules in the prostate by exposure through the perineum. The success of his radical operation depends to a great extent upon early diagnosis, and he advocates routine rectal examination of all male patients over forty years of age. He insists that most prostatic cancer arises in the posterior lobe where it can often be felt as a small hard nodule very early in the disease.

In contrast, Chauvin and Mosinger point out five processes concerned in the genesis of cancer of the prostate, and conclude from their histological studies that prostatic carcinoma has a "pleuricentral" origin rather than a "mono-

central" origin. They believe that cancerous adenoma arises in lobules which are already adenomatous rather than in healthy glandular lobules. They base their impressions on the careful study of 115 hypertrophied prostates removed by suprapubic operation. In this group there were 6 (5.22 per cent) which showed malignant change.

Kolmert believes that the statistical material offered by Barringer (more than 280 cases of prostatic cancer) will not bear a critical investigation since the diagnoses in these cases were not always definitely established. In his report, 75 cases of definitely proved prostatic cancer were selected from 160 cases treated in Uppsala as carcinoma of the prostate, and the diagnoses were proved histologically, clinically, and roentgenologically if metastases were present. During the same period in which these 160 cases of cancer were treated, 759 cases of benign hypertrophy of the prostate were seen, the incidence of prostatic cancer therefore being 17.4 per cent. Kolmert distinguishes two types of cancer, the primary form which arises within the gland itself, and the degenerative form in a pre-existing adenoma.

Myers studied the tissues removed by prostatectomy and electroresection in cases of clinically benign prostatic hypertrophy and found evidence of carcinoma in 29.4 per cent. He advises a careful pathological examination of all removed prostatic tissue. He believes that prostatectomy has an advantage over transurethral resection in that it removes early malignant involvement and gives a chance for ultimate cure instead of simple relief from obstruction.

All these authors stress early diagnosis as the most favorable means of combating carcinoma of the prostate and, as an aid to this end, Ferguson describes in detail the aspiration method of obtaining biopsy material from patients suspected of having prostatic cancer. The object of this method is to differentiate neoplastic from non-neoplastic tissue, however, attempts to classify tumors or to grade them by this method will fail except in rare instances. Ferguson's figures tend to prove that the accuracy of the method improves with the experience of the surgeon, study of autopsy material, and the experience of the pathologist studying the biopsy material.

five months or over. In compiling the corrected infant mortality all infants weighing less than 1500 gm. were considered previable and these deaths were deducted. Also cases in which syphilis and congenital malformations were the sole cause of death were deducted. Thus 509 cases were excluded which leaves a total of 289 deaths or a corrected infant mortality rate of 1.78 per cent.

There was a total operative incidence of 8.6 per cent. Among the 14861 spontaneous deliveries there were 602 infant deaths a gross mortality rate of 4 per cent whereas among the 1381 operative cases 196 infants died a gross infant operative mortality rate of 14 per cent.

TABLE I—GROS AND CORRECTED INFANT OPERATIVE MORTALITY

| Op. procedure | N | Infant deaths | Gross infant mortality per cent | Corrected infant mortality | Corrected infant mortality per cent |
|------------------|----|---------------|---------------------------------|----------------------------|-------------------------------------|
| Low forceps | 65 | 3 | 5 | 0 | 4.28 |
| Middle forceps | 90 | 4 | 4.5 | 3 | 3.5 |
| Cesarean section | 38 | 44 | 5 | 4 | 8.3 |
| Breech trial | 3 | 6 | | 5 | 6.5 |
| Vaginal delivery | 8 | 5 | 3 | | 6 |
| Dührsen | 7 | 3 | 17.6 | 3 | 17.6 |
| Brant-Hicks | 3 | 5 | 100 | 0 | 36 |

TABLE II—CESAREAN SECTION INFANT MORTALITY

| Indication | N | Gross infant mortality | Corrected infant mortality | Corrected infant mortality per cent |
|---------------------------|----|------------------------|----------------------------|-------------------------------------|
| Disproportion | 8 | 4 | | 3 |
| Abnormal position | 4 | 15 | 6 | 5 |
| Placenta previa | 4 | 7 | 5 | 1.3 |
| Transverse | 6 | | 5 | 8 |
| Previous cesarean section | 5 | | | 7 |
| Ruptured uterus | 7 | 3 | 3 | 4 |
| Unobstructed | 4 | | 1 | |
| Total | 54 | 44 | 4 | 8.3 |

The Voorhees bag was inserted for the induction of labor for toxemia 126 cases, cervical dystocia 19 cases, placenta previa 28 cases, transverse presentation 9 cases, ablation placenta 9 cases and prolapsed cord 8 cases.

There were 40 infant deaths following the use of the bag. Twelve of these deaths occurred following the induction of labor for toxemia and 16 in the cases of placenta previa in which the bag insertion was the treatment of choice. In 12 of the 40 infant who died death was due to prolapsed cord following the expulsion of the bag with incomplete dilatation of the cervix.

EDWARD I. CORNELL, M.D.

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Van Bogaert Van Cauteren and Scherer describe a case of prostatic carcinoma with bony changes involving the spine pelvis ribs and later the long bones in a male aged forty four. The symptoms at first were pains in the extremities later involving other parts of the body. The x ray findings and clinical symptoms were similar to those of Paget's disease of bone. Only once during these observations were there any urinary symptoms and these were quickly relieved by urotropin.

On autopsy a very small hard carcinoma of the prostate was found with extensive metastases to the abdominal lymph glands the liver lungs and almost the entire skeleton.

These authors conclude that the general condition of the patient remains better in Paget's disease in which the cachexia of malignancy is not present. The bony changes in Paget's disease are of a more fragile type and not the ivory like changes as in osteoblastic carcinoma. The high content of phosphorus in the blood which is found in Paget's disease is not diagnostic since their patient with prostatic carcinoma had a content of phosphorus in the blood which was from 8 to 10 times the normal.

Hager and Hoffmann in their statistical report state that the presence of metastasis is a paramount factor in the choice of treatment and in the prognosis. It is probably the deciding factor in the determination of relative cures. In their series metastasis was demonstrated by the x rays at the initial examination in 107 cases and after the first examination in 26 instances over a period of five years. It was apparent that fully 25 per cent of the cases of prostatic malignancy had demonstrable bone metastasis at the time the diagnosis was first made.

There is great variance and considerable confusion of opinion when treatment of carcinoma of the prostate is discussed.

Young who devised the radical perineal operation demonstrates the types of cases in which success can be expected by this procedure in one of his papers. In his series of 33 cases he reports 17 (53 per cent) as apparently cured. Four of his patients have lived ten years postoperatively, 1 of these for twenty two years without signs of recurrence. He states that the radical operation is not difficult the mortality is low. Normal micturition and complete urinary control have been obtained in many cases. In those cases in which the patients were not cured but died later of metastasis the local result was often good.

A German author Schanz reports a series of 144 cases of prostatic cancer. Of these 44 or 31

per cent were sufficiently early to warrant radical operation. He believes that if the prostatic capsule is involved in the carcinoma infiltration the condition is too advanced for radical operation. Postoperative x ray therapy is given routinely. Two of his patients lived more than five years after operation and 40 per cent lived more than three years. In the past four years Schanz has used permanent suprapubic fistulas only when the urethra did not permit instrumentation. In all other cases obstruction was relieved by electro-resection.

Higgins and Crowell divide cases of carcinoma of the prostate into groups: (1) carcinomas which are very small and are found on microscopic examination of the removed hypertrophied prostate; (2) carcinomas which are confined to the prostate; (3) carcinomas which extend beyond the prostate but which are not associated with urinary obstruction; and (4) carcinomas which extend beyond the prostate with associated urinary obstruction.

In the first group the authors believe postoperative x ray irradiation is of some value. If it is technically feasible they advise radical surgery followed by roentgenotherapy. Transurethral resection should be employed to relieve urinary obstruction and in inoperable cases they believe x ray therapy is of value in retarding the growth of the tumor lessening pain and reducing the bleeding.

Blumel believes that removal of the cancer either suprapubically or by the perineal route is the treatment of choice whenever this is possible. He believes that transurethral removal of the obstruction should be done in cases in which removal of the cancer is not feasible. His experience with deep x ray therapy has been disappointing.

Keyes and Ferguson describe an operation for implanting radon seeds into the cancerous prostate through a cystotomy opening. The seeds are accurately spaced by implantation through a perforated plate which fits over the vesical surface of the prostate with the aid of an ordinary radon seed applicator. Of 14 patients operated upon more than three years ago 2 developed urethrorectal fistulas. In 2 patients the bladder failed to close. Of these 14 patients 4 are still alive with out evidence of active cancer.

Barninger is not enthusiastic about surgical removal of the cancerous prostate because the results by and large are poor and the immediate mortality high. He believes that deep x ray therapy alone even by the best methods is inadequate. He believes that external irradiation must be supplanted by some form of irradiation

within the prostate itself. The suprapubic implantation into the prostate of radon seeds is comparatively simple as far as the implantation of the lateral and subtrigonal lobes is concerned. However, if we turn to the posterior lobe, the lobe that is wholly subvesical, we appreciate how difficult any implantation of this lobe from the vesical side may be. The posterior lobe is almost always involved in the growth, and suprapubic implantation must be supplemented by perineal treatment of this lobe.

If Barringer is reasonably sure that there is no involvement of the lateral and subtrigonal lobes and the cancer is confined to the posterior lobe, then the ideal method of irradiation is through the perineum by means of radon needles which are inserted in much the same way as the instruments used for an aspiration biopsy. The tissue of the posterior lobe, the periprostatic tissue, and the perilymphatic invasion around the seminal vesicles can be easily reached by this method. This perineal irradiation must be repeated at intervals until the prostate is sclerosed. Radon seeds may be implanted perineally, but they cannot be as accurately placed as the removable needles.

A series of 158 cases of prostatic carcinoma treated chiefly by telerradium, at a distance of from 7.5 to 10 cm, given through multiple portals was reported by Burnam. A total dosage of from 100 to 300 gm hr was given within from two weeks to three months, the variation depending upon the condition of the patient. About 30 of these 158 cases were treated with telerradium and some other form of therapy. Burnam has observed that prostatic cancers vary greatly in their sensitivity to radiation and in their malignancy. Cross-firing with radium at a distance or with roentgen rays is the most valuable palliative method at present. In cases of obstruction not promptly relieved by irradiation, he believes electroresection is indicated, which is to be followed by more irradiation.

The English author, Nitch, states that the best results from x-ray therapy for prostatic cancer are obtained by the five-field-maximum methods of Holfelder and Reisner. The immediate results from x-ray treatment are often excellent but the ultimate results are disappointing. Nitch says radium effects are better. He has a method of radium application in which 14 mgm of radium are used on the posterior and lateral surfaces of the prostate by means of the insertion of needles

after perineal exposure of the prostate. Fifty milligrams are applied to the vesical surface of the prostate by means of a metal box and 5 mgm are inserted into the prostatic urethra. The metal box containing the radium is enclosed in a Pilcher bag and is applied to the vesical surface of the prostate after suprapubic cystotomy, and the tube is attached to the Pilcher bag containing the 5 mgm of radium meant for the prostatic urethra. Nitch believes the results from this procedure are better than those from any other conservative procedure.

Caulk condemns palliative suprapubic cystotomy for obstruction due to cancer as an unnecessary procedure. Suprapubic enucleation of a cancerous prostate should never be done as it hastens the progress of the disease. Conservative perineal prostatectomy is seldom advocated for this condition. Caulk, himself, uses a combination of radon-seed implantation and x-ray therapy and believes in the relief of obstruction by means of the transurethral operation when it becomes necessary.

In summarizing one can say that practically all the contributors agree that obstruction due to prostatic carcinoma should be relieved by transurethral electric surgery. Though widely varying modes of treatment are favored and employed, a curative measure which is reasonably safe and reasonably successful has not as yet been found.

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GENITO-URINARY SURGERY

ADRENAL KIDNEY AND URETER

Braasch W F and Hammer H J *Renal Fusion Urograph Data and Their Clinical Significance Brit J Urol* 1938 10 219

The clinical recognition of renal fusion has become more frequent in recent years as a result of the routine use of excretory urography. Clinical recognition by this method was possible in 95.5 per cent of 102 cases reviewed. There is need for a simpler terminology. Adopting the vertebral column as an anatomical basis, renal fusion may be classified as bilateral, unilateral and prevertebral. This eliminates the necessity of using such indefinite terms as horse shoe kidney, caked kidney and crossed renal dystopia.

Careful inspection of the renal outline in the original roentgenogram should permit recognition of bilateral fusion in about half of the cases. The recognition of unilateral fused kidney by its outline is less frequent. The arrangement of multiple shadows of stones and the characteristic outline of large single stones in cases of renal fusion will often indicate the presence of the anomaly.

The position of the renal pelves in cases of bilateral fusion is variable, but the following features are of interest: (1) the low level of one or both renal pelves in relation to the vertebrae—more than 60 per cent being below the third lumbar vertebra—and (2) the proximity of the right pelvis to the vertebral margin being greater than that of the left pelvis. Although the two pelves usually are situated closer together than normally, the distance separating them is not uniform and it may be so great that the presence of fusion would seem impossible. In one case the distance separating the pelves was 16.7 cm. Approximation of the pelves with renal dystopia may simulate fusion. Although the pelves in cases of renal fusion are frequently fixed by surrounding tissues, considerable excursion may be visualized in one or both segments.

In differential diagnosis, which may be difficult, the possibility of the presence of the following conditions should be eliminated: (1) bilateral renal fusion and incomplete renal rotation with ectopia; and (2) unilateral renal fusion and crossed renal dystopia without fusion. Recognition of the presence of prevertebral fusion may be difficult when the lower pelvis is obscured by the vertebral shadow or when there is insufficient function in that segment. Probably the most significant diagnostic factor in the recognition of fusion is the characteristic axis of the lower calyx, which is usually directed toward the isthmus. In cases of unilateral fusion, the relation of the pelves to one another in the urogram may be of surgical importance. In many cases the two pelves are so closely interrelated that separation of the renal segments would be difficult or impossible.

Evidence of dilatation in either the calices or the pelves or both is associated with many cases of renal fusion. This usually indicates the presence of stasis, although in some cases it does not. Pyelectasis and caliectasis were sometimes observed among patients who never had pain. Lumbar pain is sometimes observed among patients who do not have evidence of pyelectasis or caliectasis. Fused kidneys removed at necropsy may show gross evidence of a minor degree of pyelectasis without apparent ureteral obstruction. In some cases this may be a residual deformity caused by previous obstruction. In other cases, however, it may be inferred that pyelectasis is a congenital abnormality rather than a pathological complication. The existence of renal stasis can best be demonstrated by the use of delayed retrograde urography and renal stasis will be found present to a variable degree in many cases of renal fusion. It may be a variable factor in indicating the cause of obscure lumbar or abdominal pain.

Gayet R. *The Value of Retrograde Ureteropyelography in Carcinoma of the Kidney (Intérêt de l'urétéro pyélographie rétro grade dans le cancer du rein)* *Ann. chir.* 1938 35 385

Carcinoma of the kidney is a condition which calls for prompt diagnostic investigation. Retrograde ureteropyelography has become of the greatest aid for the diagnosis of this condition. All urologists agree that this method is by far the most reliable for the visualization of lesions involving the excretory ducts.

Not only is ureteropyelography of diagnostic value, but it also throws some light upon the anatomical and pathological features of the malignancy and its degree of invasion into neighboring structures and it prepares the surgeon for certain difficulties which he may encounter during surgical intervention.

The most reliable results are obtained in carcinoma of the kidney which are still limited but in definite course of evolution. At this stage retrograde pyelography is one of the most efficient and most reliable methods of diagnosis. In advanced lesions the pyelogram shows distinctly the degree of invasion of the kidney by the tumor, but the site of origin of the lesion can usually not be traced.

The various types of renal carcinoma and their pyelographic aspects may be briefly described as follows: In general, malignant changes involving the renal pelvis and the collecting tubules are more easily visualized than lesions involving the renal cortex. Malignancies of the renal cortex should be suspected by changes of the normal renal contour by an increased volume of the kidney and by renal displacements.

Retrograde ureteropyelography is of great importance in formulating the surgical indications and

contraindications In tumors associated with mild clinical symptoms and in the presence of a kidney of normal volume the pyelogram of which shows the presence of a well localized tumor either in the pelvis or in the parenchyma, hesitation to proceed surgically is not justified Nephrectomy becomes absolutely imperative in these cases even in spite of certain difficulties that may arise during operation

In the presence of more advanced lesions, in which one of the renal poles is involved, surgical intervention is imperative as long as the patient is still in a reasonably good condition The type of surgical approach depends primarily upon the site of the lesion In this group, the immediate postoperative results were good, but recurrences could not be excluded because of the lymphatic extension It is therefore a good plan, especially in the presence of enlarged lymph glands, to remove these glands as extensively as possible, care being taken not to open any blood vessels unnecessarily, especially on the right side Obviously the results obtained in this group were not as favorable as those obtained in the preceding group

In the presence of very advanced lesions, it was formerly customary to proceed surgically even in extremely cachectic cases, but in the light of our present knowledge it has been found safer to desist from any surgical interference, both because of the frequency of recurrences, and because of the frequency of surgical accidents

RICHARD E. SOMMA, M D

BLADDER, URETHRA, AND PENIS

Puigvert-Gorro, A Primary Tuberculosis of the Urinary Bladder (La tuberculose vesicale primitive) *J d'urolog med et chir*, 1938, 46 113

The urinary bladder was formerly considered as the primary focus of tuberculous infection spreading to the remaining regions of the urinary apparatus Later, the kidneys were shown to be the primary location of urinary tuberculosis in the majority of cases, and therefore the first hypothesis has been abandoned

The author reports a case of primary tuberculosis of the urinary bladder in a twenty-seven-year-old woman Numerous examinations over a period of one year convinced him that the tuberculosis remained confined to the bladder, and demonstrated the existence of a primary tuberculosis of this organ independent of other latent or doubtful localizations of the specific infection

A genital or ascending mode of infection of the urinary bladder can be accepted only with great skepticism Several authors speak of the lymphatic vessels as the pathway for the infection of the bladder, especially in cases of secondary cystitis accompanying specific rectal lesions, but this hypothesis lacks a definite proof The descending or ureteral mode of infection may be admitted in some cases, but usually the hematogenic route of infection must be suspected

JOSEPH K. NARAT, M D

GENITAL ORGANS

Retlev-Abrahamsen, H, and Aalkjaer, V The "Pseudo-Uremia" of Patients with Prostatic Hypertrophy — The Nephrogenous Acidosis *Brit J Urol*, 1938, 10 231

Most patients with prostatic hypertrophy have definite symptoms of reduced kidney function and a disturbance of the balance of fluids There is an increase of urea in the blood and the results from kidney-function tests are poor It is a well known fact that adequate treatment (self-retaining catheters and abundant fluids) can benefit these patients considerably in a few days It is, however, also a fact that in many patients this "pre-operative drainage period" progresses slowly The urea content of the blood will not decrease, the general condition will not improve, and the symptoms of lack of fluid balance remain Under these conditions, the risk of complications, such as pulmonary and urogenital inflammations, phlebitis, and cardiac accidents, is increased

At the Bispebjerg Hospital, Copenhagen, these changes in the kidney function and in the entire condition of the organism, have been studied in prostatic patients Patients in whom tests show bad function, in spite of regular treatment, are generally believed to have a genuinely irreparable uremic condition However, systematic investigations have proved that this serious clinical picture in most of the patients is caused by an acidosis By treating this acidosis the authors have succeeded in bringing most of these patients to a state which permits operation in a short time

Patients with reduced plasma bicarbonate values are given a freshly prepared 13 per cent sodium bicarbonate solution (isotonic) intravenously, but this remedy must be used in quantitative doses based upon the analysis and the patient's body weight An overdosage will cause an alkalosis with the danger of tetany The calculation of the necessary amount of sodium bicarbonate is simple if the nomogram of Palmer and van Slyke is used

Prostatic patients with nephrogenous acidosis always have dyspeptic symptoms at the same time, and are dehydrated, therefore, in most cases it is impossible to administer sodium bicarbonate by mouth, and it would be hazardous to inject it intravenously in concentrated form The solution cannot be sterilized by boiling as it would disintegrate, and for this reason it is not well suited either as a subcutaneous injection, or as an intramuscular injection The authors state, however, that when the solution is freshly prepared no ill effects have been observed in its use intravenously Alkali treatment is thus suitable only for hospitalized patients and should be administered only quantitatively on the basis of frequent plasma analysis

Since the introduction of these investigations at the Bispebjerg Hospital, nephrogenous acidosis has been detected and treated in about one-third, or 29, of 123 patients with prostatic hypertrophy, and in

many patients with surgical kidney diseases. Often 1 liter or just a few liters of the sodium bicarbonate solution were sufficient to produce a normal plasma bicarbonate figure. In individual cases however it has been necessary to administer up to 10 liters of the solution.

Knowledge of the nephrogenous acidosis has made it possible to offer a greater number of patients transurethral resection of the prostate after but a few days treatment. In a group of 112 patients in whom the hypertrophy was not complicated by stones and upon whom operation had not previously been performed, resection could be performed in the cases of 77 before the tenth day generally from the fourth to fifth day after admission.

Thus the attainment of a normal electrolytic balance in the body is necessary for the maintenance of a normal fluid balance. Besides shortening the preoperative period, alkali therapy has in a number of cases proved itself valuable in the treatment of severe postoperative complications (bleeding and ascending infection of the urinary tract) in which increased demands are made on the kidney function. As a result of these findings examination for and treatment of nephrogenous acidosis must be considered indispensable in prostatic surgery.

C. TRAVERS STEPIA M D

Gibert J. Some Points in the Technique of Transurethral Prostatic Resection (Quelques points de la technique de la résection prostatique trans urétrale). *J d'urolog méd et chir* 1938 45 5

Gibert notes that it should be remembered that transurethral resection as used in the treatment of prostatic hypertrophy is a true resection not a channeling operation and that as much tissue as possible should be removed. It is not a substitute for prostatectomy in all cases but it gives relief in many cases in which prostatectomy involves too great a surgical risk without the necessity of a permanent cystostomy.

American urologists have developed the technique of transurethral prostatic resection to a high degree of perfection. One of the important developments in this respect is the use of various optical systems for preoperative examination of the field and for the control of the progress of the operation and the amount of tissue to be removed. In addition to oblique vision, right angle and retrograde vision is obtainable. Right angle vision is particularly useful during operation for showing the relation of the tissue to be resected to the ureteral orifices. The retrograde vision is of especial value at the close of the operation to reveal any remaining tissue that should be removed so as to leave a smooth surface. Oblique vision at the close of the operation should show the upper pole of the verumontanum and the bladder cavity in the same field.

Resection operations even with careful visual control occasionally do not give satisfactory results. In some cases a small fold of tissue may be left which may interfere with satisfactory emptying of the blad-

der. In other cases as American authors have noted the space cleared by the resection appears on re-examination to be partially filled again by pathological tissue. They attribute this to a tendency of the adenoma to push into the free space that has been created. The author has observed 1 case of this kind in which after the removal of 9 gm. of the tissue from a small adenoma, urination was still difficult. Endoscopic examination showed the presence of considerable tissue at the lower pole of the two lateral lobes. 14 gm. of this tissue were resected with subsequent relief of symptoms. Such occurrences are rare and they do not decrease the importance of optical control by the newer methods.

The importance of retrograde vision has been shown in 2 of the author's cases. In one it demonstrated a small calculus lodged behind a projection of tissue at the bladder neck. In the other a resection done when an optical system with oblique vision only was available gave the patient considerable relief but was not deemed satisfactory as considerable residual urine persisted. A second examination with retrograde vision showed a fold of tissue at the right side of the bladder neck. Removal of this tissue resulted in normal micturition with satisfactory emptying of the bladder. ALICE M. MEYERS

Gutiérrez R. Carcinoma of Cowper's Gland (El cáncer de la glándula de Cowper). *Med rec mex* 1938 18 251

From a study of the literature it appears that the surgical conditions of Cowper's gland have received little attention. Altogether only 5 cases of cancer of this gland have been described. In females the Bartholin glands which are homologous to Cowper's glands in the male are more frequently found to be the seat of carcinomatous processes. This report is based on the author's personal observation of a primary carcinoma of Cowper's gland which had been diagnosed and operated upon by him.

After having reviewed the literature on this subject and discussed the anatomy and embryology of these glands, Gutiérrez briefly summarizes the most commonly encountered pathological changes such as (1) chronic inflammation (2) acute inflammation (3) cystic changes (4) tuberculosis (5) calculosis and (6) tumors.

The case reported by the author was that of a seventy-year-old man presenting a history of an old gonorrheal infection. For many years he was being treated for a urethral stricture. When seen at the clinic the urethra was found to be very sensitive and the patient complained of a marked dysuria and nocturnal frequency. Upon closer examination both Cowper's glands were found to be markedly hypertrophic and indurated. Histological examination of a specimen of this gland removed at operation revealed the presence of a primary adenocarcinoma.

From a study of this patient and the cases reported in the literature the author concludes that pathological processes involving Cowper's glands are clinically very rarely diagnosed correctly. The incidence

of conditions involving this gland, therefore, must have been estimated as being much lower than it actually is

The symptoms of carcinoma of the bulbo-urethral glands are easily confused with those arising from conditions involving the rectum and the lower urinary tract. The most outstanding symptomatic features are pain in the rectum and in the perineum, and urinary disturbances which may be so severe as to cause complete urinary retention. The treatment is surgical and consists in the complete removal of the involved glands. The operation is followed by the application of radium needles and deep radium therapy.

The prognosis is serious in every case and none of the patients in the 5 cases reported in the literature is said to have recovered permanently. It is probable that with the aid of better diagnostic methods and an adequate surgical approach satisfactory results will be obtained. RICHARD E. SOMMA, M.D.

MISCELLANEOUS

Pyrah, L. N., and Fowweather, F. S. Urinary Calculi Developing in Recumbent Patients. *Brit J Surg*, 1938, 26: 98.

The morbid anatomy and symptoms of urinary calculi occurring in recumbent patients are described. The etiological factors are discussed and it is considered that the most important are general and local decalcification of bone, dehydration of the patient, stasis in the renal calyces and pelvis as a result of the recumbent posture, and dietetic and other factors resulting in the production of a non-acid urine. The measures which are desirable for the prevention of recumbency calculi are outlined, and it is shown that in reported cases of calculus formation it is possible to cause the calculi to go into solution if appropriate treatment is carried out and the calculi remain aseptic. If the calculi are associated with gross infection of the urine, surgical intervention for their removal is required.

D. E. MURRAY, M.D.

Adair, F. L., Dunlap, H., and Willmert, G. The Mechanism of the Action of Pyridium. *J Urol*, 1938, 40: 319.

In investigating the mechanism of the action of pyridium, the authors have endeavored not only to check its bacteriostatic and germicidal action and to determine the factors, such as concentration and pH, which influence these actions, but also to dis-

cover by what other means the drug may affect infections of the urinary tract. Antitoxic, anesthetic, chemotactic, and tissue-stimulating activities, and the reduction of virulence of the infecting organisms are all possible methods of action which heretofore have been investigated little or not at all.

In infections of the urinary tract, the average concentration of pyridium in the urine of patients given 0.6 gm. of the drug daily was found to average less than 1:20,000. With a restricted water intake of 2,000 c.c. or less daily, an average concentration of 1:10,000 was obtained. Certain strains of bacteria are able to change pyridium by reducing it to a green substance.

Urine containing eliminated pyridium was shown to have no consistent germicidal power. Raising or lowering the pH of the urine as it was eliminated with an acid or alkaline-producing diet and the administration of drug had no effect on the germicidal power of the pyridium-containing urine. Pyridium is not an active chemotactic agent. Growing *Escherichia coli* and *Staphylococcus aureus* with pyridium did not reduce the virulence of either of these organisms. *Escherichia coli* endotoxin was not neutralized by incubation with pyridium. The production of endotoxins is not suppressed by pyridium. Pyridium does not diminish the toxicity of diphtheria toxin or *Staphylococcus toxin*.

Pyridium *per se* and pyridium eliminant in the urine are both capable of suppressing the production of *Staphylococcus toxin in vitro*. This suppression is easily detected and definite, and is not explained entirely by the bacteriostatic effect of pyridium in the cultures producing toxin. Such action may explain wholly or in part the beneficial effect of the drug on infections of the urinary tract caused by the *Staphylococcus*.

The decrease of toxin production by the *Staphylococcus* is dependent on the constant presence of pyridium and does not become a permanent property of organisms grown in its presence. Most of the hemolytic strains of *Staphylococcus* from urinary-tract infections which were studied were capable of producing hemolysin and skin-necrotizing toxin. No toxin could be detected in the urine filtrates of these cases.

Pyridium appears to inhibit the multiplication of hemolytic streptococci but apparently has no effect on anaerobic streptococci. Growing hemolytic streptococci or *Staphylococcus* in pyridium broth causes no change in the colony formation or the hemolytic zone.

C. TRAVERS STEPITA, M.D.

many patients with surgical kidney diseases. Often 1 liter or just a few liters of the sodium bicarbonate solution were sufficient to produce a normal plasma bicarbonate figure. In individual cases however it has been necessary to administer up to 10 liters of the solution.

Knowledge of the nephrogenous acidosis has made it possible to offer a greater number of patients transurethral resection of the prostate after but a few days treatment. In a group of 112 patients in whom the hypertrophy was not complicated by stones and upon whom operation had not previously been performed resection could be performed in the cases of 77 before the tenth day generally from the fourth to fifth day after admission.

Thus the attainment of a normal electrolytic balance in the body is necessary for the maintenance of a normal fluid balance. Besides shortening the preoperative period alkali therapy has in a number of cases proved itself valuable in the treatment of severe postoperative complications (bleeding and a tending infection of the urinary tract) in which increased demands are made on the kidney function. As a result of these findings examination for and treatment of nephrogenous acidosis must be considered indispensable in prostatic surgery.

C TRAVERS STEPIKA M D

Gilbert J. Some Points in the Technique of Transurethral Prostatic Resection (Quelques points de la technique de la résection prostatique trans urétrale) *J d urol méd et chir* 1938 46 5

Gilbert notes that it should be remembered that transurethral resection as used in the treatment of prostatic hypertrophy is a true resection not a channeling operation and that as much tissue as possible should be removed. It is not a substitute for prostatectomy in all cases but it gives relief in many cases in which prostatectomy involves too great a surgical risk without the necessity of a permanent cystostomy.

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Hermann describes in detail the method of taking roentgenograms, suggesting first an axial view, second, a plantar view, and in a severe case, a third view, to be taken in an effort to see the subastragalar joint more clearly.

Boehler calls attention to the tuberosity joint angle which he describes as follows "If two lines are drawn along the upper aspect of the calcaneus one from the highest point to the anterior angle and the other from the highest point to the upper part of the tuberosity, these two lines will normally make an angle of 140 degrees to 160 degrees with each other, the complementary angle being 20 degrees to 40 degrees" (Fig 1) "The latter sharp angle is easier to measure and to estimate by the eye, and I call it the 'tuberosity-joint angle' (For simplicity this is referred to as the 'salient' angle.) After a fracture of the calcaneus, this angle becomes smaller, disappears entirely, or is reversed."

Any deviation from the normal angle is an excellent guide to the amount of deformity with which one has to deal, particularly from the lateral view.

THE TREATMENT OF RECENT FRACTURES

Boehler has subdivided comminuted fractures into eight groups, and has also specified treatment for each type of fracture, although the treatment of Groups 4 to 8, inclusive, is universal.

For the first group, he suggests the injection of 20 cc of 2 per cent novocaine solution into the fracture area, after which the tendo Achillis is relaxed by the knee being bent to a right angle and plantar flexion of the foot. The upward rotating fragment is replaced by little-finger pressure. A U-shaped plaster splint is applied in slight flexion (10 degrees) and molded above the prominence of the heel on both sides of the tendo Achillis. A posterior splint and two circular plaster bandages are applied over this, a walking iron is attached the next day, and the patient is allowed to walk. The plaster remains applied for six weeks.

For the second group, Boehler recommends the application of an unpadded plaster-of-Paris walking cast for six weeks, the patient being permitted to walk at once.

Fractures confined to the sustentaculum with displacement of the fragments inward are reduced by means of a compression clamp under general anesthesia and further treatment is similar to that of the last group.

For treatment of Groups 4 to 8, inclusive, the following will be required (1) lateral and oblique plantar-dorsal roentgenograms and in fractures of



Fig 1 Angle between the calcaneal tubercle and joint of 38 degrees in a normal foot (Boehler Technik der Knochenbruchbehandlung)

the anterior portion a dorsoplantar view of the injured side with a corresponding picture of the sound side for comparison, (2) spinal anesthesia, (3) a strip of felt from 40 to 50 cm long, 4 cm wide, and 3 mm thick, (4) mastisol, (5) a stainless steel Steinman pin 4 mm thick and 15 cm long, with 2 fixation screws, (6) a similar pin 5 mm thick, (7) and (8) rotating stirrups to fit the 2 different sized pins, (9) a hammer, (10) a screw traction apparatus, (11) a spring balance, (12) a screw compression clamp for the heel with pads, (13) four plaster bandages 5 m by 15 cm and 400 gm of weight, (14) a muslin bandage 10 m by 12 cm, (15) a well bandaged Braun's splint, and (16) a bed with fracture boards.

The leg is placed in a Braun splint for from six to ten days until most of the swelling has disappeared. Under spinal anesthesia, the remainder of the swelling is overcome by kneading with both hands. Following surgical preparation, the Steinman pin is driven through the posterior angle of the tuber calcanei in order that better leverage be obtained, and is fitted with a rotating stirrup. With the knee bent at a right angle, the leg is placed in a screw traction apparatus with the stirrup on the heel pin attached to the spring balance and this in turn to the hook of the screw. Twenty to 30 kilos of traction are applied to the long axis of the lower leg. The tuberosity is thus pulled down and the tuberosity angle is restored. With axial traction maintained, another pin is driven through the tibia 3 or 4 finger breadths above the medial malleolus parallel to the pin in the heel, which is fitted with a rotating stirrup and hung to the transverse bar of the screw traction apparatus. The screw is then released, the bar of the screw apparatus is lowered, and a traction of 20 kilos is made obliquely downward in the long

THE PRESENT STATUS OF TREATMENT OF FRACTURES OF THE CALCANEUS

Collective Review

RUDOLPH S REICH M D F A C S Cleveland Ohio

IT is only approximately fifteen years that attention has been paid to the problem of corrective treatment of fractures of the calcaneus in spite of the fact that they constitute the most disabling disabilities in the realm of fractures. Unlike fractures of the neck of the femur comminuted fractures of the calcaneus occur almost exclusively in working men for whom the period of disability is so vital particularly from the standpoint of economics and industrial efficiency.

A great deal of credit is due to Cotton for his interest his early papers contributed greatly to this subject. His interpretation of the disability was an outward broadening of the calcaneus from lateral impaction of the peroneal plate and a new growth of bone behind it with impingement against the external malleolus pinching of the peroneal tendons and painful limited lateral movement due either to blocking of the posterior subastragalar joint shortening of the slide or new bone being heaped up anterior to the malleolus. For treatment he suggested the removal of spurs and excision of the impacted portion of the calcaneus beneath the external malleolus followed by forcible manipulation in all directions to remove obstacles to normal motion. For a shortened and flattened heel he suggested cross sectioning of the calcaneus behind the posterior portion of the subastragalar joint and molding of the heel in a plaster-of-Paris bandage. Subsequently Funston made a more concentrated effort to overcome the shortening and upward displacement of the fractured calcaneus by pulling it plantarward with the aid of a urethral sound placed anteriorly to the Achilles tendon and on top of the calcaneus at the same time breaking up the lateral impaction with a mallet and bandage and applying the plaster-of-Paris cast with the bandage in place under the external malleolus. This was followed by Boehler's treatment of recent fractures and his work has given the subject of fractures of the calcaneus a real impetus. His treatment will be described later.

Fractures of the calcaneus may be roughly described as recent and old fractures. The inter-

est in the old fractures is mainly directed to those patients who have not received adequate treatment or have painful disabling heels in spite of adequate treatment. Recent fractures of the calcaneus may be subdivided into fractures with out displacement and with displacement. Boehler offers an excellent classification of these fractures which is as follows: (1) fractures of the upper part of the tuberosity the so-called beak fractures which are very rare; (2) fractures of the medial part of the tuberosity with or without displacement; (3) fractures of the sustentaculum tali alone; (4) fractures of the body of the calcaneus without displacement of the joint surfaces articulating with the talus; (5) fractures of the body with displacement of the lateral part, of the posterior articulation with the talus; (6) fractures of the body with displacement of the whole of the posterior surface articulating with the talus—a wide space is seen in the lateral roentgenogram between the posterior part of the talus and the calcaneus; (7) fractures of the body with displacement of the lateral portion of the posterior articular surface with accompanying subluxation between the head of the talus and navicula and between the front of the calcaneus and the cuboid (subluxation of the midtarsal joint)—the posterior process of the talus is sometimes broken off; and (8) fractures of the body with crushing of the anterior portion and dislocation of this from the cuboid. Boehler also mentions three pathological fractures of the whole of the tuberosity in cases of tabes and infantile paralysis.

Schofield also presents an excellent classification consisting of five types of fracture listed in our tabulation.

THE DIAGNOSIS OF RECENT FRACTURES

When one outlines the proper treatment of comminuted fractures of the calcaneus it is necessary first to obtain an accurate diagnosis of the type of deformity with which one has to deal. Many writers particularly Funston, Boehler, Hermann, Yoerg and Felsenreich stress the importance of accurate roentgenograms from various angles.



Fig 2 Patient turned on side opposite injury. The sandbag is placed under the inner side of the injured heel. A sterile rolled towel is placed beneath the external malleolus. Then, with solid heavy blows, impaction is broken up and the piled-up bone beneath the external malleolus is pounded down. (Hermann J Bone & Joint Surg)



Fig 3 With a scalpel, small incisions are made about an inch or so above the apex of the heel. The tongs are driven in and locked, and traction is then made in a rotary fashion, beginning downward and swinging upward, with countertraction exerted just proximal to the cuboid joint. (Hermann J Bone & Joint Surg)

condition is gauged by the thumb being placed in this depression, if the thumb nail is on a level with the outer surface of the external malleolus it is considered satisfactory. This procedure has been named "disimpaction." Offhand it would seem that such heavy pounding would cause terrific bruising of the tissue with resulting necrosis, but the tightly rolled towel with the broad-faced mallet precludes such damage. The heel is quickly molded by hand and the various motions are tested. The testing of motions, particularly the lateral, is important. It has been pointed out that this reduction may be lost in part or in whole as a result of the procedure just described, but if it is not done, it is impossible to determine whether a submalleolar bone block still exists. Whatever is lost at this stage in the reduction is regained immediately by traction and remolding.

Small stab wounds are then made in the upper posterior part of the heel, care being taken that no fracture lines are entered. The tongs are driven in and locked, and with countertraction from the crutch, which has its handle resting against the operator's abdomen or chest and the cross-bar of the sawed-off end resting against the sole of the foot in the line of the calcaneocuboid and the astragaloscaphoid joints, lusty traction is made in an arcwise fashion (Fig 3). This pull begins in a downward and outward direction and with well-sustained traction is carried upward and toward the operator. This type of pull was adopted to overcome the posterior vertical pull by the intrinsic

muscles of the foot. It is here that the value of the preliminary disimpaction is felt—the large posterior fragment can be pulled down, whereas if it were left impacted only a long-continued traction could do this.

The tongs are now removed and the heel is remolded by the use of the Forrester bone clamp (Fig 4). When the desired compression has been obtained with this clamp the traction is again applied through the clamp. The entire heel is carefully and systematically molded in this fashion. The heel is again examined manually and



Fig 4 The os calcis is remolded systematically from the external malleolus downward by means of the Forrester clamp. Again traction is exerted downward and upward with counterpressure in the os calcis and cuboid areas. (Hermann J Bone & Joint Surg)

axis of the calcaneus the forefoot being flexed plantarward and pronated at the same time. The screw is again released, its position raised and a longitudinal traction of 20 kilos again applied in the axis of the leg. This maneuver overcomes the angulation, the shortening and to some extent the widening of the heel bone. The talus is pulled away from the calcaneus and the joint between the two bones is restored. The lateral impaction under the external malleolus is compressed by the application of the compression clamp while the longitudinal traction is maintained. A felt pad is applied on the lateral side and a concave pad on the medial side below the sustentaculum tali. The compression screw is quickly tightened until the pads have moved toward one another to a distance of 35 mm. and released immediately so as not to damage the skin.

Pieces of cork are placed on the ends of the pin so as to prevent scratching of the hands and a plaster splint 100 cm. long is applied from the hollow of the knee to the ends of the toes and fastened loosely by two circular plaster bandages. After the plaster has set the screw traction is released, the stirrup removed and the leg laid on a Braun splint. Reduction is checked by lateral and oblique dorsal plantar roentgenograms. If the tuberosity joint angle has not been completely reduced, reduction should be again undertaken. The Steinman pins are fastened with plaster of Paris by means of fixation screws to prevent rotation. One week after reduction a walking iron is attached and the patient is allowed to walk.

The cast and pins are removed ten weeks after the injury in fractures of Group 4. In Groups 5 to 8 inclusive the cast is removed after from eleven to fourteen weeks, the time depending upon the degree of original comminution. The majority of cases of fractures of the calcaneus show very marked decalcification of the tarsal bones and weight bearing on the foot is painful. Boehler recommends an Unna's paste dressing for several months to prevent swelling and in addition an arch support is supplied. At the same time physiotherapy is employed.

Fractures of Group 6 are comparatively rare but present more difficult problems of reduction. This is accomplished by means of the Phelps Gocht apparatus. Before reduction is attempted three thick felt pads are applied to the skin. Powerful pressure is exerted on the middle of the plantar side of the calcaneus while the tuberosity is pulled downward with rotation around the transverse axis. The head of the talus and the front part of the calcaneus are thus brought down and the angulation is abolished, the downward

displaced portion of the posterior articular surface being pushed up toward the talus. The Phelps Gocht apparatus is then removed and reduction is carried out by the screw traction apparatus fixed by a pin.

In some instances particularly in old people with arteriosclerosis it may be desirable to carry out the treatment by continuous traction. In these cases a Steinman pin is driven through the calcaneus and mastisol is applied below the knee joint and to the dorsal and plantar sides of the foot. A long strip of felt is placed below the knee and a broad one on the back of the foot. Another piece 10 cm. long is placed transversely across the sole of the foot at the level of the midtarsal joint. A plaster splint is applied along the extensor surface of the foot and leg from the delt of the toes to the knee. The short splint is applied from the midtarsal joint to the tip of the toes on the sole of the foot. These splints are attached by means of a muslin bandage and two circular bandages are wound around them, the heel not being included. The leg in the cast is then placed on a Braun splint and the foot slung by means of a bandage to the transverse bar. The pin is fitted with the rotating stirrup, a 5 kilo weight is attached and traction is applied to the heel. After eight days lateral and oblique dorsal roentgenograms are taken and if the tuberosity joint angle has not been restored lateral impaction is reduced by means of a compression clamp applied under short ethyl chloride anesthesia. The leg remains on the splint with traction from nine to thirteen weeks.

Hermann has suggested a more conservative form of treatment. The foot and lower leg are encased in a pillow splint with appropriate bleb dressings and ice bags if necessary. When the acute local reaction has subsided a one or two day bone prep is given.

The operating kit contains a tightly rolled sterile towel, a sandbag with a sterile cover, a 7 lb. large wooden mallet, a pair of bone tongs, a Forester bore clamp, a sawed-off crutch, a scalpel, a sterile dressing and 2 rolled pieces of felt bound by adhesive (4 in. by 1 1/4 in.). Besides this kit the usual sheet wadding and plaster of Paris bandage are required.

Following a light dosage of low spinal anesthesia or gas-ether anesthesia the patient is turned on the side opposite the injury and a sandbag is placed under the inner side of the heel. The tightly rolled towel is placed beneath the external malleolus and with solid heavy blows the piled up bone beneath the external malleolus (Fig. 2) is poured down until the normal depression beneath the external malleolus is restored, which

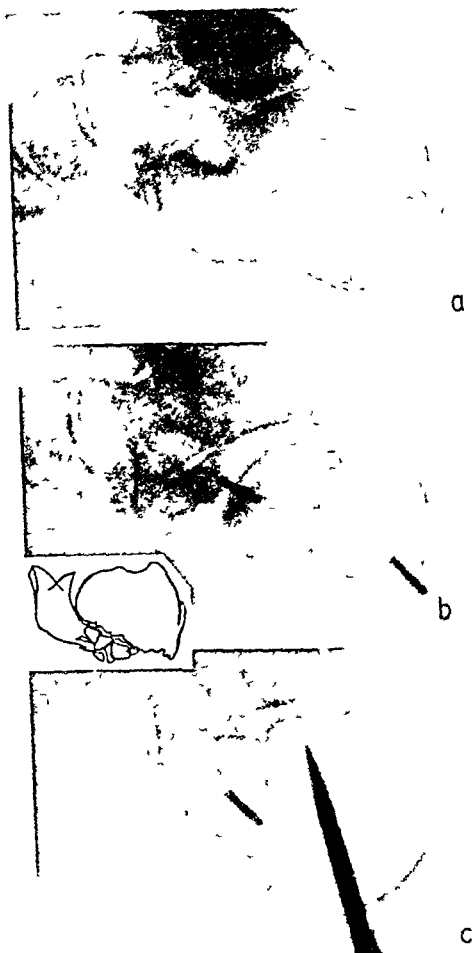


Fig 5 Typical compression fracture of the calcaneus with considerable downward luxation of the posterior surface of the joint (b) The upper angle of the calcaneus is completely closed For orientation in order to introduce the nail, 2 lead markers are used A shows the calcaneus on the normal side C shows the ideal result of reposition with the aid of the nail (Westhues Zentralbl f Chir)

the thalamus to establish the normal movement at the articulation of the instep and the hinder part of the foot with the front part, the thalamus being maintained in its place by a material which would be well tolerated and permit this spongy bone to form a rigid, unimpressionable bony callus A long angular incision exposes the lateral face of the fractured calcaneus It is made behind the fibular epiphysis in the lower leg and descends vertically behind the lateral malleolus, below the tip of which it turns to become horizontal and parallel to the lateral body of the foot and is about

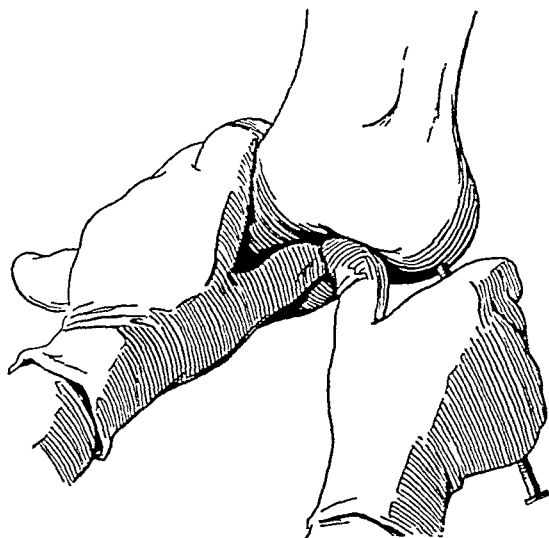


Fig 6 Reposition with the aid of the inserted nail The traumatic edema is carefully massaged away Reposition is done about eight days after the fracture has occurred (Westhues Zentralbl f Chir)

15 mm above it The horizontal part of this incision may be prolonged as far as the calcaneo-cuboid articulation The cutaneous flaps are broadly separated, and uncover the entire face of the calcaneus, the lateral malleolus, and the talus With the tendon elevator of Olier the compact cortex is laid bare A blunt dissector is introduced into the subthalamus fracture and without the least leverage on the underlying bone the spatula is inserted throughout the breadth of the calcaneus, following exactly the almost transverse course of the subthalamus fracture The thalamus is kept held up by the spatula, and the grafts, taken in advance from the inner surface of the tibia, are introduced beneath it, two or three grafts being used, as necessary The skin is carefully sutured, the leg and foot immobilized in a Boeckel splint or between two sandbags Plaster is not applied until the sutures have been removed and the scar is clean The patient is not permitted to put the foot on the ground, even in his cast, in less than four weeks The plaster is left in place for at least two months If the tibiotarsal mechanism is found to be stiff at the time the plaster is removed, mechanotherapy and massage are useful

Kessler and Hermann call attention to the frequency with which fractures of the spine are found associated with fractures of the calcaneus (10 per cent in Hermann's series) Hermann recommends routine lateral and anteroposterior roent-

check up roentgenograms are made. Tightly folded sterile dressings are placed over the stab wounds in the heel and held in place by a sterile gauze strip wound about it. A snug roll of felt is carefully placed at a very slightly oblique angle beneath each malleolus. A low plaster of Paris cast is applied with the foot in slight inversion and extreme plantar flexion. Manual pressure is applied over the pad areas while the cast is hardening. The first cast is removed in two weeks and a new cast applied with the foot at right angles and with the submalleolar pads carefully replaced. A new cast and pads are reapplied every two weeks up to ten and occasionally twelve weeks in order to check up on the condition of the skin. After removal of the last cast a special ambulatory calcaneus splint is applied at once. This is followed by physiotherapy in the form of daily massage and active foot and ankle movements. Full weight bearing is permitted without crutches ten days or two weeks after the removal of the last cast. At the end of another six weeks the ambulatory splint is gradually discarded and the patient is instructed to exercise more strenuously and increase walking on rough surfaces.

Yorg's method of reduction is even more simple. Roentgenograms having been taken the patient is placed in bed with the foot elevated and hot packs applied. The reduction of the fracture is done under general anesthesia to obtain complete relaxation. The patient is placed on a firm table on his side in order that the injured foot may be brought laterally to the edge of the table with the heel extending over the edge. The left hand firmly grasps the ankle and the leg just above. The heel is grasped with the right hand and the fracture manipulated laterally with the ball of the hand a repeated thrusting force being used until the fracture has been thoroughly disimpacted. An unusual amount of force is necessary and it is imperative that a firm grip be maintained with the left hand so that fracture of the leg be avoided. After thorough disimpaction with flexion of the knee and plantar flexion of the foot the surgeon grasps the heel and with a sudden thrust pulls it down. When an upward displacement is present because of a flattening or crushing of the posterior joint surface the surgeon brings the bone down by grasping the heel with one hand the forward portion of the foot with the other hand and pulling the sole of the foot with a sudden thrust against a firm vertical bar. An os calcis clamp is then employed to squeeze the loosened bones into position. The clamp is used to reduce the broadening and shortening of the

back portion of the heel. If a fracture and spread are present in the anterior portion of the bone the clamp should be moved forward and reapplied.

An assistant applies a moderately padded cast to the foot, ankle and leg to just below the knee. The patient is pulled down on the table with the leg hanging at right angles over the edge. The surgeon sitting on a low stool molds the cast well around and under the malleoli, back of the heel and under the arch of the foot keeping constant traction on the heel with the knee at right angles and the foot in plantar flexion. The tendon in this position is completely relaxed and the cast molded as described will hold the reduced fragments in apposition.

A roentgenogram of the foot is taken and if reduction is satisfactory the patient is allowed to be up and about on crutches in a few days but he should not walk on the injured leg. The cast is removed four weeks after reduction and roentgenograms are made. The patient is instructed to massage and to move the foot and ankle actively and passively but is not allowed to bear his weight on the injured foot. Two months after reduction another roentgenogram is taken and the patient is allowed to walk on the foot using his crutches. Strangely he does so without pain and within a week in most cases he will discard his crutches and walk without support in from two and one half to three months from the time of reduction and will have recovered sufficiently to return to his work. It has not been necessary in any instance to cut the heel tendon or to use pins or tongs to bring about or to maintain reduction. A modification of a Phelps Gocht clamp has been used to bring down a badly comminuted heel and to hold it until the compression clamp could be applied to bring about lateral pressure.

Westhues suggests a method which he has found successful in a number of cases. Eight days after the fracture a nail is driven into the posterior fragment of the calcaneus (Fig. 5) and by means of this nail the posterior fragment is forced plantarward so that the upper angle of the calcaneus is restored. By means of pull on the nail in the longitudinal direction and through abduction of the nail (Fig. 6) the length of the calcaneus is restored and the adduction of the posterior fragment is replaced. An unpadded ankle plaster of Paris boot is applied with the nail in position and the foot in slight plantar flexion. The nail and the cast remain applied for four weeks after which another unpadded cast remains applied for from two to three weeks.

The method of Lenormant and Wilmoth is based on the theory that it is necessary to raise

TABLE I—RESULTS OF TREATMENT OF FRACTURES OF THE CALCANEUS

| Author | Year pub | No. of Cases | Method of treatment | Temp total disability | Perm part disability |
|----------------------|----------|---------------------|--|---|---|
| Kessler | 1931 | 71 | Various | 3-4 mo usual 8-12 mo unusual | 20 to 25% min |
| Funston | 1933 | 52 | Tenotomy Mallet disimpaction Cast Arthrodesis if pain persists more than from six to eight mo Weight bearing in ten weeks | 5½ mo | 23 to old jobs, 8 to other full time work, 5 not returned |
| Stewart | 1934 | 36 | Various Recent cases manipulated and molded—Boehler Unpadded walking cast Subastragalar arthrodesis in 3 | 6-9 mo in cases requiring arthrodesis | Of 30 followed up, 25 good, 5 poor |
| Forrester | 1934 | 150 | Tenotomy Reduction by Boehler method Cast 2 mo Unna's paste boot sixty days Arthrodesis not indicated | 4½ mo | 18% (Ill State Ind Commission) |
| Morrison and Flamson | 1934 | | With no displacement plaster three weeks, weight bearing six weeks Upward displacement Kirschner wire traction Plaster and pins four weeks Physiotherapy Weight bearing four mo Arthrodesis 'last resort' | 3 to 4 mo | 'End results good' |
| Green | 1935 | 15 | Closed Cast with molded arch Weight-bearing immediately | 3½ mo | Ret. to previous occupation |
| Henderson | 1936 | 22 recent 32 old | Method described by Gillette Kirschner wire traction through tibia Manipulation and casts choice if possible Arthrodesis advised in 14 carried out in 3 | "Cannot be given Too many factors involved" | 6—unknown 7—excellent 6—good 2—fair 1—poor |
| Schofield | 1936 | 52 | Type I Avulsion fracture with medial displacement of sustentaculum tali Compression and cast Type II Fracture of body no displacement Cast Type III Fracture of medial process of tuberosity Boehler compression clamp Type IV Fracture of trochlear process or anterior portion of body of bone involving cuboid articulation and possibly anterior facet of astragalus Screw traction in 3, manual traction in 7 Unpadded walking cast Type V Comminuted fracture body with displacement and oftentimes compression and impaction, involvement of subastragalar joint and usually cuboid articulation salient angle decreased, obliterated or reversed Skeletal transfixion pins Compression clamp and screw traction Boehler frame (Omitting 1 case with bilateral osteomyelitis) Case with osteomyelitis Average of 52 cases | 5 mo 3 mo 5 mo 7.5 mo 7 mo 2 yrs | 6% None 23% 2% 9% 25% 12% |
| MacAusland | 1936 | 17 | Boehler | 'Impossible to estimate' | 6 too recent 10 good 1 poor |
| Hosford | 1936 | 82 | Various "Final result bears no constant relation to method employed" | 3 mo to 1 yr | 30 unknown 35 good 25 fair 12 bad |
| Jaekle and Clark | 1937 | 43 | Boehler Fractures of body Fractures of tuberosity Chip fracture into calcaneus Simple fracture neck of os calcis Average of 34 cases rated | 5.15 mo 3.7 mo 5.32 mo | 15.1% 3.25% None except 1—10% 2.4% 4.29% |
| McFarland | 1937 | 63 | Various Six with closed reduction molding and cast. Arthrodesis not advised | 5 mo to 2 yrs | 10 to 80% |
| Goff | 1937 | 5 | Closed reduction Carpenter's clamp | 4½ mo | Only 1 case rated Percentage not given |
| Loerg | 1937 | 26 | See text | Of first 20 cases 4-2½ mo 8-3 mo 5-4 mo 2-5 mo 1—over 9 mo—improving | All of 20 but last one have returned to work |
| Hermann | 1937 | 152 | See text | 6 to 7 mo 7 to 18 mo over 18 mo | 111 good 21 fair 20 poor |
| Bode | 1937 | 219 | 69 treated by reduction and splint 37 treated by splint followed by cast 94 treated by reduction and cast 19 treated by wire traction | | 9.8% 15.6% 14.9% 21.6% |
| Spiers | 1938 | 36 | Boehler (28 rated) | 6½ mo | 16 to old jobs 11 fair 1 bad |

genograms of the lower thoracic and lumbar vertebrae to rule out such fractures

THE TREATMENT OF OLD FRACTURES

As for old fractures the disabling factors are most frequently (1) pain in the subastragalar joint and occasionally involving the calcaneocuboid and astragaloscaphoid joints especially when the patient is walking on uneven surfaces (2) lateral impaction resulting in impingement of the peroneal tendons and according to some writers of the lateral malleolus and (3) spurs or exostosis formation particularly on the weight bearing surface of the calcaneus. Most writers interested in the subject of old fractures agree that treatment for the first type is subastragalar arthrodesis and in some instances calcaneocuboid and astragaloscaphoid arthrodesis in addition. For the second type excision of the impacted portion of the calcaneus under the lateral malleolus is recommended and for the third excision of all painful exostoses. The literature is in accord with the treatment suggested by Conn and the writer.

For relief of pain following old fractures of the calcaneus Froehlich recommends novocaine infiltration into the periarticular ligaments. Immediate relief is experienced and lasts for three months after which time the injection may be repeated. Froehlich states that the results are good and lasting.

SUMMARY

In spite of Boehler's and Schofield's classification of fractures of the calcaneus one might summarize the fractures as follows: (1) those without displacement or involvement of the subastragalar joint and (2) those with displacement of the subastragalar joint a loss in the tuberosity joint angle anteroposterior foreshortening and lateral widening with impaction under the lateral malleolus and occasionally spicules of bone which may result in excessive callus or spur formation.

The method of anesthesia is a subject in which there has been considerable variance. Boehler recommends the use of local anesthesia in some of his cases and in others he employs general anesthesia. Our experience has been most favorable with the use of avertin anesthesia supplemented with nitrous oxide and oxygen as the occasion arises. Spinal anesthesia has been reported in a number of recent papers.

The first group is treated by application of a plaster cast after the swelling has subsided. Treatment of the second group has made considerable progress in recent years particularly by the impetus of Boehler's work. Both Voerg's and

Hermann's treatments must be considered a distinct advance as both men have reported a convincing number of favorable results following their methods.

Regardless of the variance in the types of treatment employed the main principle is summarized as follows: to overcome the upward pull of the calf muscles and foreshortening resulting from the intrinsic muscles of the foot restore the tuberosity joint angle and overcome the lateral impaction. In some instances in which we have employed the Boehler method of reduction we have maintained the foot in Kirschner wires and on the Boehler calcaneus frame for a few days and then have incorporated the wires into plaster after some of the swelling has subsided and thoroughly checked the position by roentgenograms.

In the discussion of the end results very few of the writers have expressed an opinion as to what their criterion of good results actually is. Since the subastragalar joint has been the determining factor as to disability the question has always arisen whether or not there is pain in the joint on weight bearing and as a corollary the patient has complained of less pain the greater the limitation of motion.

In a personal communication with Hermann and Voerg they have stated that in a great number of their cases with good results there has been complete restoration of function in the subastragalar joint and this is undoubtedly a definite advance in the treatment of this most intractable fracture.

As for early subastragalar arthrodesis for recent fractures the results of Voerg, Hermann and others must unquestionably deny its value. However to say that early arthrodesis should never be done is in the writer's opinion also too dogmatic as unquestionably there are cases of severe comminution and impaction in which early arthrodesis would greatly shorten a prolonged period of disability. It is also possible that this group of cases may be diminished from time to time when our experience and technique in the reduction of these fractures improves.

As for the old fractures with disability there has been no difference of opinion and obviously no alteration in treatment. Surely there is no hope of restoring the function of the subastragalar joint and arthrodesis will overcome painful weight bearing and locomotion in a great number of these old cases.

Since fractures of the calcaneus occur almost entirely in working men the matter of disability especially to compensation board is of vital importance. A survey of our tabulation is most

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| McFarland | 1937 | 63 | Various Six with closed reduction, molding and cast Arthrodesis not advised | 5 mo to 2 yrs | 10 to 80% |
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| Hermann | 1937 | 152 | See text | 6 to 7 mo 7 to 18 mo over 18 mo | 111 good 21 fair 20 poor |
| Bode | 1937 | 219 | 69 treated by reduction and splint 37 treated by splint followed by cast 94 treated by reduction and cast 19 treated by wire traction | | 9 8% 15 6% 14 9% 21 0% |
| Spiers | 1938 | 36 | Boehler (28 rated) | 6½ mo | 16 to old jobs 11 fair 1 bad |

enlightening, as it shows a definite reduction in the percentage of disability in cases reported by various authors over a period of approximately seven years

The extensive bibliography is an excellent testimonial to the interest in this most disabling fracture

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SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Calvet, J Bone and Joint Complications of Paratyphoid Infection (Les complications osseuses et articulaires des paratyphoïdes) *J de chir*, 1938, 52 289

Calvet reports 2 cases of osteoperiostitis due to paratyphoid infection, one paratyphoid-B and the other paratyphoid-A

In the first case, the patient had had repeated attacks of pain in the left tibia since an attack of paratyphoid fever eleven years previously, this occurred at the site of an injury which the patient had sustained eight years before the attack of paratyphoid fever The roentgenogram showed the middle portion of the tibia to be thickened, there was a small clear area in this region At operation, a small cavity containing a little thick pus was found beneath the cortex This was cleaned out and the periosteum closed Paratyphoid-B bacilli were found in the pus The patient made a good recovery

In the second case, a swelling developed on the sixth rib on the right side while the patient was convalescing from a fever that had been diagnosed as typhoid, later, pain developed in the upper part of the tibia These lesions were punctured and fluid was withdrawn, fistulas then developed The tibial fistulas remained open for years, the rib fistula closed but a painful area remained It was nearly fourteen years after the primary attack of fever that this lesion was curetted Paratyphoid-A bacilli were found, and the patient was given specific vaccine by mouth The lesion healed well

The author has collected 16 other cases of osteitis and osteo-arthritis due to paratyphoid infection, which make 18 cases in all, but he does not claim that these are all the reported cases of paratyphoid osteitis In a few of these cases the symptoms of the original febrile attack were severe, in others, as in the author's 2 cases, they were relatively slight In some cases in children, it was difficult to obtain a definite history of fever of the typhoid type While the initial symptoms of bone involvement usually developed within from fifteen days to two months after the febrile attack, it was sometimes years before the diagnosis was established and treatment instituted, as noted in the author's cases

Paratyphoid osteitis and osteo-arthritis may occur at any age, most of the patients were between eighteen and thirty years of age If the patient was a child, the lesion was more apt to be an osteo-arthritis, if an adult, osteoperiostitis The long bones were most frequently involved, especially the tibia, and the ribs or vertebrae in some cases Several of the patients showed multiple lesions

Of the 18 cases only 2 (including the author's second case) were due to paratyphoid-A infection,

11 were due to paratyphoid-B, and 5 to paratyphoid-N The N bacillus is distinguished from the A and B organisms only by its serological reactions, bone involvement with this type of the paratyphoid bacillus is more apt to be found in the flat than in the long bones

Not all cases of paratyphoid bone involvement show definite suppuration, a lesion that is purely inflammatory at first may later become suppurative, this is the most usual type In cases with multiple lesions, the various lesions may be of different types, some may subside without treatment, while others require surgical treatment Paratyphoid osteo-arthritis usually shows an acute onset with swelling of the joints, pain and disability, and sometimes a slight fever

Diagnosis of the condition is made on the basis of the clinical symptoms and history, aided by the roentgenographic findings Definite diagnosis of the type of infection depends upon bacteriological study of the pus discharged through fistulas or obtained at operation

In the treatment of paratyphoid osteitis and osteo-arthritis, surgical measures are usually required, they may consist of simple puncture, especially in osteo-arthritis If there is suppuration, the cavity must be thoroughly exposed and cleaned, with removal of any sequestra Occasionally more radical measures are required In most cases, and especially in those with multiple lesions, it is best to combine specific vaccine therapy with surgical measures The specific vaccine is given by Emile-Weil's method, four injections ($\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1 c cm) in two weeks, then four more of 2 c cm each Instead of the specific vaccine the combined typhoid-paratyphoid A and B (T A B) may be employed

ALICE M MEYERS

Coley, B L., and Higinbotham, N L Giant-Cell Tumor of Bone. *J Bone & Joint Surg*, 1938, 20 870

The causative factor responsible for the giant-cell tumor is still unknown The authors believe that the traumatic theory offers the most logical explanation

The giant-cell tumor is a solitary lesion with rare exceptions and is primarily an affection of the long bones It is a disease of youth and early middle life It originates in the epiphyseal region, and extends progressively with little tendency to destroy the adjacent shaft until late in its course The most frequent sites are the femur, tibia, and radius In a series of 385 collected cases these 3 bones were involved in 310 cases

The opinions concerning the pathological changes in this tumor differ widely Despite the advancement of many arguments that the giant-cell tumor is not a true tumor, its behavior and course reveal certain features that lead most present-day writers

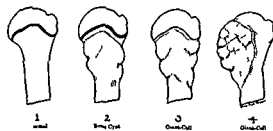


Fig 1 Schematic drawing showing location in respect to the epiphyseal line of the involved area in bone cyst (1) giant cell variant of bone cyst (2) and giant-cell tumor (3). Note especially the proximity of the process to the epiphyseal line in 3, also that the epiphysis is about to unite. Note also that in 4 the process involves the head rather than the shaft side of the epiphyseal line (now united) although it extends across to involve the metaphyseal area somewhat.

to regard it as such. It is difficult to conceive how a lesion that possesses the power of persistent growth and the tendency to recur after incomplete removal and to invade the adjacent tissues and even in some instances to develop metastases can be regarded as a chronic inflammatory process. The giant-cell tumor is usually benign but malignant forms are encountered and may result from the transformation of a tumor that is histologically benign at the outset.

The first symptom is a dull ache which increases with activity. Disability most frequently occurs later in the disease after the pain has been experienced but often before the swelling appears. It is usually manifest in slight restriction of full range of motion of the nearby joint and lameness after attempts at functional activity. Later in the course of the disease there will be evidence of increase in size of the tumor interference with full range of motion and occasionally increased surface temperature and in rare instances pulsation of the thin shell covering the tumor.

The giant cell tumor usually presents a characteristic roentgenographic appearance. It shows a destructive area in the epiphyseal region which involves adjacent metaphyseal bone but which exhibits little extension to the cortical bone of the shaft. The area of involvement is irregularly spherical shows trabeculations due to destruction of the cancellous bone and tends to extend across the bone to destroy the whole transverse diameter before progressing shaftward. While it may extend to the cartilage of the articulation it seldom invades it and even late in the disease this structure remains intact. When erosion has progressed sufficiently to expand the cortex it may later destroy it so completely that no evidence of a bony shell is seen in the roentgenograms and only the periosteum remains as a limiting membrane. When pathological fracture occurs it is apparent on roentgenographic examination although marked displacement is unusual. However the affected side of the bone is usually

compressed so that tilting is seen and irregularity of the joint surface is produced.

Three errors in making a diagnosis as pointed out by Codman are

1 The films may be characteristic and yet the sections may be unequivocally in favor of some other diagnosis.

2 Both films and slides may be interpreted as giant cell tumor and yet the rapid fatal course may indicate an error of interpretation.

3 The films, sections and clinical course for several years may seem to assure the diagnosis and yet a sarcoma may eventually appear at the site of the lesion.

The question is not settled as to which is the better treatment surgery or radiation. In general surgery is preferable for accessible lesions especially those situated in the region of the knee and radiation for lesions that are inaccessible especially those in the spine the pelvis or the neck of the femur. One should avoid the use of radiation and surgery in the same case. Borderline cystic lesions and true bone cysts are treated according to the same criteria and following the same principles. It should be remembered however that since cysts are usually seen in individual who have not attained full bone growth the effect of the roentgen ray on the adjacent epiphysis may result in retardation of growth and consequent bone shortening. This is of more moment in the lower extremity. Caes of advanced giant cell tumor in which the bony shell has been completely destroyed are sometimes unsuitable for operation. Some of these have responded well to radiation.

The aim in all cases in which curettage is done is thorough removal of all tumor tissue and perfect healing of the wound. A twenty-four hour skin preparation is advised. Protection of the wound edges with towels fastened with Michel clips is recommended. Uncontrolled bleeding may be forestalled by the use of an Esmarch bandage or tourniquet. Accurate hemostasis of soft tissue is essential. A large window cut in the cortex assures good exposure. The periosteum is preserved. The thoroughness with which the cavity is curetted is a measure of the probable successful result. The cavity is snabbed with zinc chloride and flushed with Dakins or normal saline solution. The wound is closed layer by layer. Packing or drainage of the wound is strongly condemned. Firm snug dressings of gauze roll and sheet wadding held by flannel bandage reinforced with adhesive strips maintain pressure evenly and help prevent wound infection by preventing hematoma. Elevation of the part for from forty-eight to seventy-two hours minimizes the swelling and prevents excessive oozing. The wound is not disturbed for a week. If the degree of involvement suggests the danger of a pathological fracture protection by splints or by plaster castings is provided. Weight bearing is avoided until regeneration of the bone is believed to be adequate. Motion of the contiguous joint is encouraged at the

TABLE I—DIFFERENTIAL FACTORS

| Factors | Bone Cyst | von Recklinghausen's Disease | Giant-Cell Tumor |
|----------------------|---|---|---|
| Age | 5 to 18 years | Young and middle-aged adults | Young adults (20 to 40 years) |
| Location | Metaphysis | Generalized, usually in shaft | Epiphysis |
| Bone involved | Upper femur, humerus, and tibia | Many bones | Lower femur, upper tibia, lower radius, and upper humerus |
| Fracture | Frequent (50 per cent) | Frequent | Less early, but in 25 per cent |
| Gross appearance | Multilocular, serous | Multilocular | Friable, reddish-brown, bloody |
| Appearance of tissue | Whitish | Fibrous | Reddish |
| Giant cells | Present | May be present | Plentiful |
| Vascularity | Slight | Avascular | Very vascular, even telangiectatic |
| X ray appearance | Typical | Typical | Typical |
| Chemistry | Normal phosphorus, phosphatase, and calcium | Calcium and phosphatase elevated, phosphorus diminished | Normal phosphorus, phosphatase, and calcium |

earliest moment possible. Caliper splints for tumors of the tibia and femur permit walking without danger of late fracture. This activity hastens bone regeneration. Appropriate splints are used for lesions in the upper extremity. It is not necessary to use bone chips, and it is unwise to fill the curetted cavity with them as has been recommended by some surgeons. Muscle and fat grafts are mentioned only to be condemned.

Resections and amputations are rarely indicated for primary tumors. These procedures are more frequently employed for complications following radiation therapy, such as radiation osteitis with fracture and non-union, ulceration, and infection.

Roentgen-ray therapy has many advantages over the use of the radium pack. It is more widely available, more economical, and a shorter time is required to deliver a comparable dose. No standard of technique for roentgen therapy has been generally accepted. The present tendency is to use smaller doses, to repeat the cycles less often or at longer intervals, and to withhold later treatment in the absence of symptoms and in the presence of a favorable roentgenographic appearance. The roentgen rays in large doses destroy the regenerative powers of the bone; in small doses, they may fail to arrest the disease; therefore, the exact dosage for the individual is a matter of profound judgment or of fortuitous circumstance, yet, where surgical experience in the treatment of this condition is lacking, roentgen therapy is the safer procedure. As a rule, however, regeneration and healing require a much longer period after radiation than after surgery, so that after the former the casts and braces must be worn over a much longer period. Protection during the regenerative phase is essential regardless of the treatment employed, for the pathological fracture usually spells functional impairment and a painful neighboring joint.

Surgery alone yielded the largest proportion of excellent results and the smallest proportion of poor results; radiation alone gave the next best, and combined surgery and radiation gave the poorest results.

Coley's toxins were employed without any other treatment in 2 cases, in one the result was excellent, and in the other, good.

ROBERT P. MONTGOMERY, M.D.

Loggòscino, D., and De Marchi, E.: Vascularization and Aseptic Necrosis of the Carpal Bones (*Vascularizzazione e trofopatie delle ossa del carpo*). *Chir. d'organi di movimento*, 1938, 23: 499.

The authors have undertaken the study of the carpal bones to investigate the numerous changes which they undergo following trauma and other factors.

Many possible causes of aseptic necrosis of the carpal bones are reviewed from the literature, among

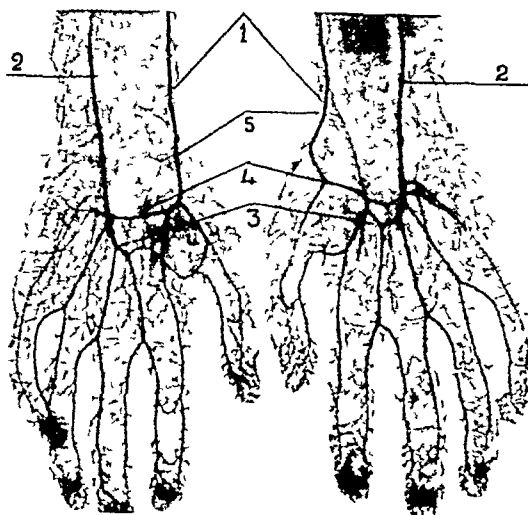


Fig. 1. Male, seven years of age. Roentgenographic preparation before removal of the soft parts. Note the difference in the vascular formation in both hands. 1 Radial artery 2 Ulnar artery 3 Superficial volar artery 4 Volar profunda artery 5 Dorsal artery of the wrist.

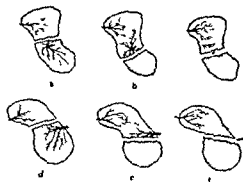


Fig. 2 Schematic representation of an injected specimen copied from Lexer by Schnek. The figures represent the various types of fractures occurring in the scaphoid in the antero-posterior view (a, b and c) and in the lateral projection (d, e and f). The artery from the tuberosity is easily visible. If the fracture line runs between two areas supplied by different arteries both fragments remain viable (a-d). If the fracture isolates a fragment from its blood supply the distal fragment undergoes necrosis if the wrist is not immobilized for a long time (b-e). If the fracture goes right through the one of the entrance of the principal artery and if in addition immobilization is insufficient necrosis also occurs in a part of the other fragment (c, f).

which are trauma gonorrhea tuberculosis syphilis infections in the blood stream and local infective processes.

Axhausen proposed the theory that the necrosis is due to a thrombosis of the nutrient vessels but was unable to demonstrate it in serial sections. The majority of authors believe however that the thrombosis is secondary and not primary to trauma.

The literature on the subject is extensively discussed. Logroscino devised a method for study by

isolating the brachial artery in a fresh cadaver and then washing out the peripheral vessels with warm physiological salt solution. After the arterial tree is completely washed the radiopaque substance is injected under considerable pressure.

The arteries of the carpal bones of 8 female and 12 male cadavers were injected with good diffusion of the radiopaque substance in half of the cases. A great variability was found in the arterial supply and also in the number of tributaries and the caliber of the lumen.

Each of the carpal bones were examined in detail both by means of radiopaque injections and study of the dried specimens. Marked inconsistencies of the blood vessels were shown. Numerous roentgenograms of the different types of fractures and case histories are presented. CAPLO S. SCUDERI, M.D.

Lance M. Girard L. and Lance P. Osteoporosis and Osteomalacia of the Spine in Adults (Les ostéoporoses et ostéomalacies du rachis chez l'adulte). Rev. d'orth. 1938 25 385

Lance and his associates note that osteoporosis of the spine in the aged is only an exaggeration of a normal phenomenon. The chief symptom is kyphosis. Osteomalacia causes considerable deformity and often eye pain increased by movement. In senile osteomalacia the roentgenogram shows a complete disappearance of the bony trabeculae of the bodies of the vertebrae and of the ribs.

While the occurrence of decalcification of the spine in the aged has been recognized for some time it has only recently been pointed out that a similar type of osteoporosis or slight osteomalacia may be present in adults earlier in life. At this age period osteoporosis is associated with pain while in aged persons there is no pain or only slight pain unless actual osteomalacia is present. In younger adults unless the osteoporosis is the result of a trauma the pain is always located in the dorsal thoracic or thoracolumbar region. In cases in which trauma precedes the onset of symptoms the authors are of the opinion that the trauma reveals rather than causes the osteoporosis. In senile osteoporosis may cause a kyphosis but this is not limited to the upper part of the spine as is typical of senile osteoporosis but involves the whole spine or is limited to the lower part of the spine in other cases the only deformity may be a small gibbosity. In younger adults as well as in the aged a severe form of osteomalacia may develop in such cases the deformity of the spine is marked and the patients are usually confined to bed.

At the end of the War and in the years that followed in countries where the food supply had been much restricted a form of osteomalacia due to starvation was observed similar to that observed during periods of famine in India and China. This form of osteomalacia involves not only the spine but also other bones of the body. In the spine it causes kyphosis and kyphoscoliosis the most important roentgenographic sign is an absence of osteo-

TABLE I

| | Scaphoid | Semilunar | Trapezium | Trapezoid | Trapezoid | Carpal | Triquetrum |
|-----------------------------|----------|-----------|-----------|-----------|-----------|--------|------------|
| Base of metacarpal | 43 | 51 | 9 | 5 | 3 | 9 | 0 |
| 4th metacarpal | 7 | 7.8 | 3.4 | 5 | 1.9 | 8 | 10 |
| 5th metacarpal | 3 | 4 | 5 | 8 | 3 | 6 | 7 |
| 4th metacarpal of 1st ramus | 6.9 | 4.7 | 9.6 | 7.7 | 5 | 8.7 | 8.8 |
| Volars of 1st c | 7 | 3.3 | 7 | 1.69 | 6.4 | 3 | |
| Radii of 1st c | 3 | 7 | 6.0 | 3.6 | 8 | | |
| Ulna of 1st c | | | | | | | |

Tab. I The average number of nutrient foramina for each surface are presented. Note that the semilunar has the least number of foramina. Next is the trapezoid and the scaphoid which has a large surface area. In reality therefore the semilunar has the poorest blood supply after which comes the scaphoid and last the trapezoid.

fication in the osteoid zone, and a considerable increase in its thickness and volume, a lesion considered pathognomonic of rickets. A study of the starvation diet of these patients shows the prolonged deprivation not only of vitamins and mineral salts, but also of proteins and lipids.

Definite diagnosis of decalcification of bone can be made only by biopsy and by roentgenographic study, as biopsy is difficult when the vertebrae are involved, the diagnosis of this condition in the spine depends upon roentgenography. If there is any considerable change in the form of the vertebrae and thickening of the intervertebral discs, this is an indication of osteomalacia rather than osteoporosis. Determination of the calcium, phosphorus, and phosphatase of the blood, is also of importance, in the types of osteoporosis and osteomalacia under consideration, there is usually a slight diminution in blood calcium and phosphorus, but an increase in the phosphatase. By means of roentgenograms and blood analyses, osteoporosis and osteomalacia in adults may be differentiated from tumors of the vertebrae and from other bone diseases which may be localized in the spine, such as Paget's disease, chronic arthritis deformans, and Recklinghausen's disease.

With regard to treatment, the best results are obtained by the administration of calcium and of some substance that aids the fixation of calcium, usually irradiated ergosterol. The authors give calcium in the form of calcium gluconate by subcutaneous injection, or in severe cases by intravenous injection. Pain is best relieved by the wearing of some form of rigid corset or cast, in aged patients, who do not tolerate constant pressure well, this support must be removable, either a celluloid corset or a bivalved plaster cast.

The cause of osteoporosis or osteomalacia of the spine in adults may be definite and prolonged deficiencies (deficiency of vitamins, lipids, mineral salts), as has been shown in the osteomalacia occurring in famines. Endogenous factors that interfere with the proper absorption and utilization of calcium and phosphorus are also important, including intestinal, hepatic, and renal disease. The rôle of the endocrine glands in such diseases of the spine is more difficult to evaluate, as general involvement of all the bones is more apt to occur in cases of endocrine dysfunction.

The authors present a tabulation of 13 cases of senile osteoporosis and 53 cases of presenile and adult osteoporosis, including cases collected from the literature and cases observed by themselves.

ALICE M. MEYERS

Wilensky, A. O. Osteomyelitis of the Pelvic Girdle
Arch Surg, 1938, 37, 371

The pelvic girdle is made up of the sacrum and innominate bones. The latter consist of an outer thin plate of compact bone surrounding an interior mass of cancellous bone and no marrow cavity exists. The blood supply is poorest where the bone

is thinnest, and in young persons it is most abundant in and near the centers of ossification or around the acetabulum. The generally poor blood supply probably explains the infrequency of pelvic osteomyelitis. When it occurs, it is most common in the acetabular region.

Clinically, osteomyelitis can be classified as primary, extensible, or hematogenous in type. The differentiation between the first two types, especially after trauma or surgery, is often difficult. The pathogenic origin of the hematogenous type is usually apparent. Primary osteomyelitis follows an open wound which communicates with the bone and is usually a fracture or gun-shot wound. Following the Kraske operation for rectal cancer and the excision of sacral dermoid cysts, primary osteomyelitis of the pelvis may develop.

Extensible forms of the disease are seen after suprapubic prostatectomy, in which palliative and conservative treatment suffices to effect a cure of the infection in the pubic bone. Only 2 cases of osteomyelitis of the pubis after symphysiectomy in obstetrical cases have been recorded.

Hematogenous osteomyelitis of the pelvic girdle is similar to that of other bones except for some factors peculiar to its location. The author records 12 cases in a total series of 346 cases of osteomyelitis of all types, an incidence of about 3.5 per cent. The pathological picture, pathogenesis, and mechanism is not distinctive, but the lesions in the pelvic bones show no regularity in size or location. In the pubis and ischium they vary from concentrated involvement of inconsequential segments to involvement of nearly the entire anatomical segment. In the ilium they are most often in the neighborhood of the acetabulum or along the crest. Periosteal lesions are as common as those which involve the entire thickness of the bone.

The general symptoms are similar to osteomyelitis elsewhere, those of a severe generalized infection, but the evidences of localized disease may be few or absent in the early stages. Roentgenograms are of no help during the first ten days. When local signs appear they vary with the segment of the pelvis which is involved. Osteomyelitis of the sacrum may point externally with marked local swelling, or internally with tenderness and swelling palpable on rectal examination. The sacro-iliac joint may be the site of the infection. With abscess formation, spinal meningitis or the cauda equina syndrome may appear. When the abscess is anterior to the sacrum it may extend down to the para-anal region, remain as an ischio-rectal abscess, point up to the iliac crest, or extend out into the gluteal regions.

When the infection involves the flare of the ilium it may point inward or outward. Early perforation through the thin shell of bone is frequent and may prevent spontaneous healing until thorough surgical drainage is instituted. With involvement of the acetabular region, the exact localization of the process usually depends on roentgenological evi-

dence. The involvement may be intra articular or extra articular and is easily confused with primary disease of the hip joint or upper end of the femur. When abscesses form they may point externally where they are readily drained or internally where they can be detected by rectal or vaginal examination. Hematogenous osteomyelitis of the pubic bone is usually of a subacute type and is recognized late when abscesses develop in the space of Retzius or externally over the pubis or down into the perineum and inner upper aspect of the thigh. A chronic fistula in these regions may result. Secondary involvement of the bladder with pyemia perforation or stone formation may occur. When the ischium is involved there is pain tenderness swelling abscess or fistula formation and the exact localization of the lesion depends on rectal vaginal or roentgenological examinations. The roentgen rays are invaluable in the diagnosis of pelvic osteomyelitis which usually is first demonstrable in from eight to ten days as a periosteal thickening. Osseous changes appear later and depend on the location and extent of the lesion.

The treatment of osteomyelitis of the pelvis consists mainly in the incision and drainage of frank abscesses or the attempt to eliminate resulting sinuses. Radical operations are usually feasible only when the lesions involve the flare of the ilium although recently radical resections of the sacro iliac regions have been successfully accomplished. In general the mortality in osteomyelitis of the pelvic girdle is 12 per cent. CHESTER C. GLENN, M.D.

Brailsford J. F. Brodie's Abscess and Its Differential Diagnosis. *Brit. M. J.* 1938 2 119.

A series of 62 cases of chronic abscess of the long bones is presented. Twice as many occurred in male patients as in female patients. The duration of symptoms was from one week to thirty years from the onset until the case came to the attention of the author. Single bone foci were present in 45 cases while the lesion was associated with multiple bone foci in 17 cases. Over one third of the cases showed the focus to be in the lower end of the tibia which is in contrast to recorded cases of acute osteomyelitis in which the upper end of the tibia was more frequently involved. With few exceptions the primary lesion was in the metaphyseal extremity of the diaphysis extending to the medulla and rarely perforating the epiphyseal cartilaginous plate. The perforation occurred only in cases of tuberculous abscess.

In the majority of the cases periosteal reaction was lacking unless the abscess was large and involved the whole extent of the diaphyseal extremity.

The organism recovered at operation usually proved to be the staphylococcus aureus although in 2 cases the bacillus typhosus was present and in 5 of the 6 cases in children under five years of age the lesion was apparently secondary to a tuberculous infection elsewhere.

The symptoms were usually insidious in their onset with recurrent attacks of pain gradually increasing in severity. The pain was usually described as being boring or burning in character and was at times severe. The adjacent joint at times developed effusions with acute phases in which there were hot and often fluctuating swellings in the affected limbs.

In patients who the epiphyses had not fused roentgenograms revealed an area of cancellous destruction extending from the epiphyseal growth cartilage toward the medulla. The boundaries of the destruction were not usually sharply defined but were demarcated by a surrounding area of bone of increased density. The whole lesion tended to be spatulate in shape. No sequestre were noted. Staphylococcus infections rarely perforated the epiphyseal cartilaginous plate but after the epiphysis was fused penetration of the epiphyseal region was present and the process even invaded the joint in some cases.

After surgery the bone defect persisted at times for many years without recurrence of the infection although the patients not uncommonly had attacks of pain in the region and undue redness especially after local injury. Periosteal accretions when present disappeared after the abscesses were evacuated.

The differential diagnosis between typical staphylococcus abscess, tuberculous gumma, endothelial myeloma and acute and subacute pyogenic osteomyelitis is discussed at length.

ROBERT PORTIS, M.D.

Meyerding H. W. The Results of Treatment of Osteogenic Sarcoma. *J. Bone & Joint Surg.* 1938 20 933.

In the period from 1909 through 1934 there were 216 cases of osteogenic sarcoma at the Mayo Clinic. In 187 cases tissue was available for microscopic verification at the time of the original diagnosis in the remaining 29 cases the diagnosis was based on the clinical and roentgenological findings. The average age of the patients when they presented themselves at the clinic was twenty nine and three tenths years. There were 126 males (67.4 per cent) and 91 females (32.6 per cent). Trauma was a possible factor in 44.9 per cent of the cases. The average duration of the symptoms before the patients came to the clinic was ten and four tenths months.

The tumors in the 187 cases were re-examined histopathologically and whenever possible the grade of malignancy was determined according to the method of Broders. There was a slight increase in the percentage of so called five year cures in comparison with those in the author's previous publication. The percentage in the papers published in 1921 and in 1935 were 16.5 and 18.8 respectively while the percentage of five year cures in the cases in which the diagnosis was proved microscopically for the entire period is 23.4.

When every painful bony structure is subjected to thorough roentgenological examination bone tumors will be diagnosed earlier. When these early cases come into the hands of those experienced in diagnosis

sis, in grading the degree of malignancy, and in unbiased choice of treatment, more limbs will be saved and more lives prolonged

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Royle, N. D. An Operation for Paralysis of the Intrinsic Muscles of the Thumb *J Am M Ass*, 1938, 111 612

The inability to oppose the thumb to the other fingers because of paralysis of the intrinsic thenar muscles leads to "flat hand" deformity

The author describes an operation of tendon transplantation for the purpose of restoring the function of the thumb

The sublimis tendon of the middle or ring finger is detached at its insertion and drawn out through an incision on the wrist. This tendon is then passed up the sheath of the flexor pollicis longus and brought out through an incision at the level of the metacarpophalangeal joint of the thumb. Here the bifurcated sublimis tendon is sutured to the short flexor tendon of the thumb and the opponens pollicis. The author advises the "living suture" method. The thumb is held in position of opposition and flexion for ten days, then motion is encouraged

HARVEY S. ALLEN, M.D.

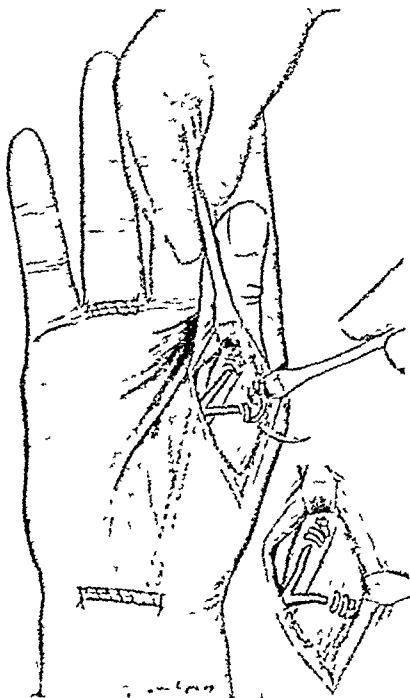


Fig 1

FRACTURES AND DISLOCATIONS

De Victorius-Medori, F. The Process of Fracture Healing Following the Exclusion of One Kidney. Calcium Changes in the Blood Following this Procedure (Il processo di riparazione delle fratture in seguito all'esclusione funzionale di un rene. Il comportamento della calcemia in rapporto ad entrambe tali condizioni patologiche) *Polidin*, Rome, 1938, 45 sez. chir. 297

The author experimented with rabbits, fracturing the tibia and fibula of one leg and ligating one ureter. A series of animals were used both for experimental and control study, the controls being without ureteral ligation. The animals were killed at the end of five, ten, fifteen, twenty, twenty-five, and thirty days after the operation.

After the ligation of one ureter, the calcium content of the blood rose from the normal of 10 mgm to 13 mgm and returned to normal after fifteen days, which showed that calcium retention had occurred in most of the experimental animals.

The fracture produced in animals with a ligated ureter healed more rapidly than the fracture in the control animals. Theoretically, this more rapid callus formation in those animals in which the excretion from one kidney was disturbed, was due to the hypercalcemia of the blood with more rapid deposition in the fracture site.

The author gives an excellent bibliographical review of the subject. CARLO S. SCUDELLI, M.D.

Blundell Bankart, A. S. The Pathology and Treatment of Recurrent Dislocation of the Shoulder Joint *Brit J Surg*, 1938, 26 23

Recurrent dislocation of the shoulder joint is uncommon and is peculiar to athletes and epileptics.

The following alleged causes are based on an erroneous conception of the real pathology:

- 1 Abnormal laxity of the capsule
- 2 Fracture of the glenoid
- 3 Fracture of the humeral tuberosities
- 4 Deformity of the head of the humerus
- 5 Contracture of some muscles about the joint

The following operations which are performed for the cure of this disability are alike in that they ignore the real pathology and attempt to deal empirically with the resulting clinical condition:

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- 2 Operations designed to support the capsule by the placing of a sling of muscle beneath the joint
- 3 The Nicola operation and its modifications
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The author states that recurrent dislocation is produced from an entirely different injury from the ordinary traumatic dislocation which is the most common of all dislocations of the joints. The ordinary dislocation is produced by a fall on the abducted arm which forces the head through the lowest and weakest part of the capsule between the sub-

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HARVEY S ALLEN, M D

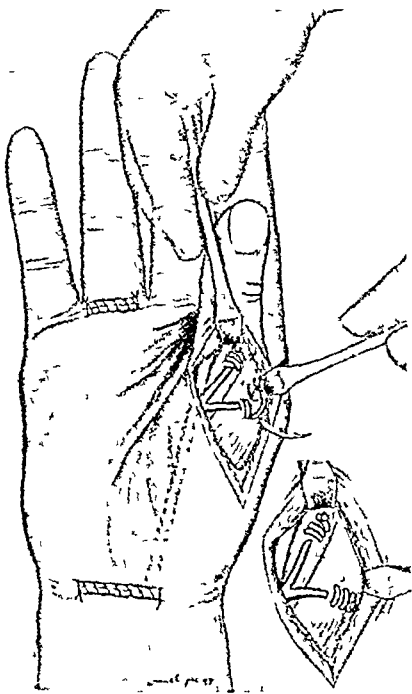


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scapularis muscle and the triceps muscle. When this type of dislocation is reduced the capsule heals completely and the dislocation never recurs.

The dislocation which afterward tends to recur is produced by a fall directly on the back of the shoulder or on the elbow which forces the head out of the joint by shearing the fibrocartilaginous glenoid ligament from its attachment to the bone. This defect remains permanent since there is no tendency for the detached glenoid ligament to reattach itself to bone.

The author has found this lesion at operation in 27 consecutive cases and he believes that this is the only pathological condition present in these cases. He has devised an operation to repair this defect. The glenoid ligament is exposed by the following technique:

- 1 A 5 in. incision is made from just above the coracoid process along the anterior margin of the biceps.
- 2 The coracoid process is divided with an osteotome and the detached portion is pulled down with the three muscles attached to it.
- 3 The subscapularis muscle is divided near its insertion into the lesser tuberosity and the anterior margin of the glenoid ligament is thus exposed.

The glenoid ligament is reattached with silk worm gut passed through holes in the anterior border of the glenoid which has been freshened.

The arm is bandaged to the side with the elbow well forward. It is left in this position for one month after which time active movement is begun.

The dislocation has not recurred in any of the 27 consecutive cases operated upon by this technique.

DANIEL H. LEVINTHAL, M.D.

Billet H. Fractures of the Shaft of Both Bones of the Forearm (*Les fractures diaphysaires des deux os de l'avant bras*). *Rev d'orthop* 1938 25 437.

Billet discusses the important anatomical factors in the treatment of fractures of the bones of the forearm and especially the arrangement and points of attachment of the muscles and their relation to the bones. He shows that the predominant action of the pronator muscles tends to increase the fragmentation in fractures of the shaft and that muscle fibers are often interposed between the fragments. These complications occur most frequently in fractures of the radius as is indicated by the position of the points of insertion of the muscles.

From a consideration of these anatomical factors Billet draws the following conclusions in regard to the treatment of fractures of the shaft of the bones of the forearm: this type of fracture must almost invariably be treated by surgical methods not closed reduction. Operative reduction should usually be followed by some type of osteosynthesis. How-

ever the author believes that osteosynthesis is necessary for only one of the two bones the radius.

In the case of infants and children under five years of age the fractures are almost invariably supracondylar and operative treatment is not necessary. However in older children the fractures may be accompanied by fragmentation and green stick fractures occur so that operative reduction is often necessary in children as well as in adults. Even in cases without marked displacement of the fragments muscular fibers are apt to be interposed between the fragments and interfere with perfect reduction of the fracture by closed methods.

Osteosynthesis may not be necessary in open reduction if the fragments are not much displaced if their edges are smooth and if the reduction can be made perfectly but these cases are relatively rare. For most cases some form of osteosynthesis is necessary to hold the fragments in the correct position. Many French surgeons use plates fixed with screws but the author prefers the clamp devised by Dujarier which he uses almost exclusively in these fractures. These clamps require only two drill holes and when the latter are correctly placed the clamps hold the bone firmly.

While osteosynthesis is necessary in most cases of fracture of the shaft of the bones of the forearm the author has found that it is not necessary to treat both the radius and the ulna by this method. The radius is the mobile bone; it is the one under most strain from the pull of the muscles and it is also more closely surrounded by the muscles which factors bring on the danger of the interposition of muscle fibers between the fragments. Experience has shown that fractures of the ulna heal well either with perfect or satisfactory alignment after reduction; this is true especially if the fracture of the radius has been perfectly reduced with osteosynthesis. Pseudarthrosis of the ulna is rare even without perfect reduction; the muscles attached to this bone are so placed that there is much less danger of interposition of muscle fibers between the fragments than in the case of the radius. The author has never seen an unsatisfactory reduction of the ulna in cases in which the radius has been perfectly reduced by osteosynthesis. ALICE M. MEYERS

CORRECTION

Dawson E. K. Innes J. R. M. and Harvey W. F. Debatable Tumors in Human and Animal Pathology. I. Giant Cell Tumor of Bone. *J. Laryngol & Otol* 1938 53 491.

Attention is called to the above title of an abstract which appears on page 597 of the December 1938 issue of the INTERNATIONAL ABSTRACT OF SURGERY. The journal reference is incorrect and should read: *Edinburgh M J* 1938 45 491.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Martensson, K.. Results of Injection Therapy of Varices and a Clinical-Anatomical Study of the Relapses *Acta chirurg Scand*, 1938, 81 237

Upon studying what has been written with regard to the results of injection therapy, the author finds that immediate results are nearly unanimously considered good. Opinions of the later results diverge widely, and few writers have taken into consideration all of the factors that influence the number of relapses.

The author presents his findings in a study of injection therapy, undertaken with a view to determining in what respects the reports of examinations made by other observers have been inadequate. He considers that the conditions of injection therapy are (1) the changes due to the disease, (2) the resources of the injection therapy to cope with these changes, and (3) the effect of the respective injections.

The writer notes that when the disease has reached the phase at which it may be established by available diagnostic resources, there exist, during a certain period, conditions which are favorable to injection therapy. During this period, the varices are in their whole extent accessible to treatment, the endothelium is capable of reaction, the conditions of circulation in the part of the vein concerned are relatively favorable, and conditions for the working up of a new, sufficient system are also favorable. If the varicosities already existing in this period begin to spread, the conditions for a primary thrombosis grow less and less favorable, and if the main vein is reached by the insufficiency, there is still greater difficulty in the formation of a new, sufficient system.

Touching upon the results of injection therapy alone, the author notes that varices are to be looked upon as local symptoms of a disease of unknown cause. In the earlier stages it is characterized by degenerative changes in the walls of the vein. These result in vein insufficiencies. The varicosity is at first local, but sooner or later it progresses to more and more branches, and also proximally along the main vein. Possibly, too, it involves the connecting branches to the deep system. The further the disease progresses, the graver are the pathologico-anatomical and the pathophysiological changes, less favorable are the conditions for injection therapy.

Injection therapy attacks the disease by putting out of action the functionally incompetent veins by thrombosis. The formation of a collateral venous circulation is easy. A main vein that is blocked may be hazardous to the circulation, and the rapid formation of a collateral circulation is necessary.

The quality of the thrombosis is influenced by the conditions of flow in the vein-insufficiency, the irritability of the endothelium, the way the injection

is given, and, possibly, the injected material. The injection therapy seems to give an effective and lasting cure of incompetent veins in some patients, in others there are relapses, and in still others there is no effect whatever. No one can predict in what cases, or in how high a percentage of cases any one of these results may occur. When the varicose changes are found to occur as high up as the saphenous-femoral junction, not even a thrombosis up to this junction will prevent a relapse. Conditions for a relapse exist from and including the ninth day and disappear about nine months after the thrombosis. True relapses have, however, been observed clinically two years after the treatment. They may have begun earlier although they did not become visible clinically until two years afterward.

To determine why, how, and in what cases relapses occur after a complete thrombosis, the author made a study of relapses of varices after injection treatment. The material studied consisted of 102 cases from Serafimerlasarettet. From this study, he observes that a causal factor in the occurrence of relapses after injection treatment is a centrifugal vein stream or reflux proximal to, or on a level with, the thrombus. Relapses have occurred as a result of the destruction of the thrombus, recanalization, or the formation of a passage. The filling up with blood that follows has been caused by a reflux, either direct or by way of an insufficient collateral from a proximal insufficient section of a vein.

Relapses also have occurred by the refilling of insufficient veins collapsed by blocking, but without thrombi. The cases in which relapses have occurred have been those of patients in whom the vein insufficiencies of the lower leg have spread to the thigh either as irreversible varicose degeneration or as vein insufficiency. Altogether, 55 such cases were registered and relapses have occurred in all but 2.

The cases in which relapses have not occurred have been those of patients with limited vein insufficiencies in the lower leg. There were 45 of these, and it is probable that in these injection therapy can arrest the progress of the varix disease. The relapses have, as a rule, occurred earlier and have been more complete in the cases in which only a smaller section had been thrombosed. All relapses have occurred between one month and about one and one-half years after the termination of the treatment. Relapses usually have been accompanied by an extension of the insufficiency, and this has been greatest and most marked in the cases in which only a small section has been thrombosed. It is probably the centrifugal vein stream, suddenly turned on at the destruction of the thrombus, that has been responsible for the occurrence. A fully satisfactory effect was obtained in the cases with limited vein insufficiency of the lower leg and in which the technique was easily accomplished. In the other cases

it was impossible to get complete thrombosis partly because of technical difficulties and partly because of the risk. In one case with the gravest form of insufficiency the result was entirely negative. The results from this later study are well in keeping with what might be expected from examination of the conditions of the injection therapy reported in the earlier summary. HERBERT F THURSTON, M.D.

Linton, R. R. A New Surgical Technique for the Treatment of Postphlebotic Varicose Ulcers of the Lower Leg. *New England J. Med.* 1938 219: 367.

The distressing sequela of ulceration of the lower leg following deep phlebitis has been a problem in medicine for many years. Although the postphlebotic varicose ulcer may be healed after rest in bed with or without skin graft, it was very often found that the skin grafts rapidly disintegrated soon after the patient became ambulatory. Extensive analyses of this condition suggested that the underlying cause for failure of the ulcer to remain healed lay in the veins which connect the deep venous systems of the leg with the superficial. These are known as the communicating veins but are sometimes called the perforating veins. It has been shown that in the presence of incompetent communicating veins there is considerably more edema formation in the lower leg than when only the saphenous veins are incompetent.

The author published a detailed description of the anatomy of these communicating veins in a recent article. In this article he presents in detail the methods of preparation of patients with a post-

phlebotic varicose ulcer before ligation is done. Healing of the ulcer is secured by the patient being put to bed and the use of wet packs of warm compresses of 2 per cent boric acid or saline solution. If the ulcer is too large to heal spontaneously, a Thiersch skin graft is applied to hasten the healing. When the skin graft has healed, the long saphenous vein of the affected limb is ligated in the groin. The patient is discharged with an elastic adhesive bandage applied directly to the skin from the toes to just directly below the knee. This is changed every two or three weeks. At the end of six weeks, the patient returns to the hospital for the ligation of the communicating veins.

If the ulcer lies on the inner aspect of the lower leg, the medial group of communicating veins and the popliteal group of communicating veins are ligated. If it lies on the anterior surface of the leg, it is usually necessary to ligate the anterior group also. When the ulcer is on the posterior or posterolateral surface, the lateral group and the popliteal communicating veins are ligated and, in addition, the short saphenous vein is ligated in the popliteal space.

The author reports in detail a typical case of postphlebotic varicose ulcer which appeared eleven years after a deep thrombophlebitis of the right leg following a cesarean section. Despite numerous injections of sclerosing solution into the veins, the ulcer persisted. Following ligation of the long saphenous vein and the medial group of communicating veins of the lower leg, and obliteration of the long saphenous vein with injections of quinone urethane solution, the ulcer has remained healed for nine months.

HERBERT F THURSTON, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Murray, G D W, and Best, C H The Use of Heparin in Thrombosis *Ann Surg*, 1938, 108 163

Murray and Best have found heparin in its purified form to be non-toxic, and useful in instances in which intravascular clotting is likely to occur. These investigators found experimentally that this substance will prevent thrombosis, and their clinical results substantiate this finding.

Arterial anastomoses were accomplished with significant success in heparinized animals. Further, it was shown that if the vessel lumen remained patent for seventy-two hours, the suture lines had healed and there was no longer a tendency toward the occurrence of thrombosis. After a year only a slight scar was seen.

The authors pointed out that whereas peripheral embolectomy has been of no benefit after twelve or fifteen hours because the damaged intima initiates subsequent thrombosis, they were able to remove artificial emboli from heparinized animals after periods varying from twenty-four to seventy-two hours with satisfactory results. Thrombosis rapidly developed in their controls.

The transplantation of organs failed in all of the authors' cases in which it was attempted without heparin.

The purified form of heparin was found to be non-toxic to humans, and left no cumulative or residual effects. Clotting time raised to one and one-half hours returned to normal in an hour and twenty minutes.

The results obtained in cases of peripheral embolism have been encouraging. No amputations have been necessary, and in several patients there was a return and persistence of the peripheral pulse beyond the occlusion. The authors suggest heparin in cases seen too late for embolectomy, with the hope that it may prevent extension of the clot, and assist other measures used to restore the collateral circulation. It is also advocated for splenectomy, postoperative pulmonary embolism, phlebitis, and in blood transfusions, the donor being heparinized or the substance substituted for citrate.

Heparin is said not to dissolve a blood clot, nor will it initiate postoperative hemorrhage, however, its use is not advised within four to twenty-four hours postoperatively, since hemorrhage from vessels not bleeding previously, but following a rise in blood pressure, will be aggravated.

The administration of heparin is effected by the ordinary intravenous drip, 10 units of heparin being added to each cubic centimeter of saline. The average patient requires approximately from 25 to 30 drops per minute, the rate being governed by its

effect on the clotting time, which should be estimated every few hours. The injection is discontinued when the patient resumes normal activity in bed, when the appetite is good, and when deep breathing is not uncomfortable.

The authors warn against the use of heparin in the presence of active hemorrhage.

ALTON OCHSNER, M D

ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Thorndike, A, Jr Trauma Incident to Sports and Recreation *New England J Med*, 1938, 219 457

The author discusses the more common types of trauma incident to sports and recreation, such as contusions, sprains, and strain. The pathology and treatment of these conditions are similar, and early, adequate treatment for the control of internal hemorrhage in minor injuries is important. If the hemorrhage is slight, the hematoma to be absorbed will be small, there will be less fibroblastic scarring, and the period of disability will be shorter. A good end-result depends upon a prompt return of function, with a minimum of scarring. SAMUEL KAHN, M D

Lambret, O, Driessens, J., and Cornillot, M The Action of Infra-Red Irradiation on the Humoral Syndrome of Extensive Burns (Action de l'irradiation infra-rouge sur le syndrome humoral des brûlures étendues) *Rev de chir*, Par, 1938, 57 478

In their previous studies of the effect of extensive burns, Lambret and his associates have found that the chief factors are diminution of the volume of the circulating blood with diminution of the blood chlorides and acidosis, and hyperazotemia (resulting from proteolysis in the burned tissues).

In experiments on dogs, it was found that the application of infra-red irradiation to the burned area definitely kept the blood chlorides at normal level or even above normal. The effect of maintaining the blood volume was less marked, but the reduction in blood volume was never as marked in animals treated with the infra-red rays as in those with burns of equal extent not so treated. The effect of infra-red irradiation on acidosis was variable, it was more marked on the alkaline reserve than on the pH of the blood, but both tended to return to normal more promptly than in untreated animals. The effect of the infra-red rays depends upon the intensity of the irradiation and the extent of the burn. Infra-red irradiation reduced the polypeptides more markedly than the other nitrogen constituents of the blood. This effect was most marked at the time when in untreated animals the polypeptides were at their highest level.

The authors have had occasion so far to treat only 2 human cases of extensive burns with the infra red rays. The first case was that of a woman fifty years of age with an extensive burn of the head face and neck. The characteristic changes especially hypochloremia and acute acidosis (with diminution of both the pfl and the alkaline reserve) were observed but after treatment with the infra red rays these symptoms were much diminished at the end of twenty four hours and entirely relieved at the end of forty eight hours while in untreated cases such symptoms became more marked in this period. In the second case in which there was an extensive burn of the arm and shoulder infra red irradiation increased the blood chlorides reduced the acidosis and diminished the polypeptides of the blood but did not entirely prevent an increase of the blood urea and amino acids.

In its effect on hypochloremia and acidosis of extensive burns the action of the infra red rays is similar to that observed in postoperative shock. This effect is apparently due to the fact that the infra red rays reduce the transudation of plasma from the vessels of the injured part (burn or operative wound) and thus prevent any marked loss of chlorides and bicarbonates although it has not been demonstrated that infra red rays reduce the permeability of the blood vessels. In postoperative cases infra red irradiation has little effect on the increase in the polypeptides of the blood but in burns this effect of the infra red rays is very definite. In burns the infra red rays apparently act directly on the polypeptides produced in the tissues with the result that they are rapidly transformed into amino acids as is indicated by a slight increase of the amino acids in the blood but the amino acid are immediately transformed and absorbed by the organism hence they show no marked increase in the blood.

In experimental animals infra red irradiation has a definitely favorable effect on the general condition. While untreated animals with extensive burns appear very sick refuse food and drink but little water animals with equally extensive burns treated with the infra red rays are much more lively and eat and drink normally. A similar effect on the general condition was observed in the 2 human patients treated by infra red irradiation for extensive burns.

ALICE M. MEYERS

Wangensteen O H The Surgeon's Role in the Treatment of Infection Wisconsin M J 1938 37 629

More than any other factor infection accounts for the surgical failures of the present day. Yet in the treatment of established infection the surgeon can accomplish nothing specific unknown to the preantiseptic period.

In localized infections incision and drainage are indicated but surgeons realize that incision of extending areas of virulent infection will not only do no good but will do actual harm. In spreading infections the surgeon must do what he can to bolster the

natural defenses of the body in their conflict against bacterial invasion. How this can be accomplished is a question yet unanswered. The use of antitoxins sera and immunotransfusions is undoubtedly of some value but it is difficult to establish the fact that it has improved the results of treatment in extensive or systemic infections. Recently a new drug sulfanilamide seems to be effective in many bacterial infections and is alleged to have a particular influence in hemolytic streptococcal infections.

Passive hyperemia has been a means of fostering the conservative treatment of infections. It is hard not to believe that the tissues may be more damaged than the bacteria by prolonged venous stasis. Aggravation of existing swelling exerts a deleterious influence on infection.

The author has not had enough experience with roentgen treatment of infection to assay its worth.

Of the various antiseptics many have a distinct value but their chief merit would appear to be hastening the clearing up of an infection which has already become localized. They possess no value in localizing an infection. The host must still fight out the conflict with bacterial invasion with no specific help from outside sources.

The treatment utilized by the author for the management of acute pyogenic infections of the extremities is outlined. In this plan the entire extremity concerned including the body trunk is immobilized in a plaster of Paris cast. The affected member is positioned in a cast in such a manner as to most favorably affect swelling by gravity drainage. Windows are cut in the cast to permit frequent scrutiny of the infected area. When there is definite evidence of suppuration a small incision is made for evacuation of the exudate through a window. During the past two years this method has been employed in a large number of threatening infections of the extremities including acute osteomyelitis suppurative arthritis phlebitis lymphangitis fascial space infections of the hand and cellulitis. The only cases in which early incision is warranted are those of acute tenosynovitis.

The great importance of rest in the healing of wounds and in curing disease has been known for a long time. The immobilization which can be secured by the application of a spica plaster bandage to the body is ever so much more efficient than that obtained by any other method.

Wherein does the beneficial influence of immobilization lie? The relief of pain by the release of muscle tension is important. Further the lymphatic channels through which the infection spreads lie in the fascia overlying the muscles. The lessening of muscle movement in plaster serves to obviate distipation of the infection and is an important factor in aiding the natural defenses of the body in localizing the infection.

The rôle played by posture is probably equally as important. In part its effect is the antithesis of that secured by Bier's hyperemia in which venous stasis increases tissue tension. Reduction of the swelling is

an important item in the treatment of infection and trauma. One inch of gravity, the author believes, is worth three weeks of physiotherapy in the reduction of swelling. Elevation of the extremity lowers the venous pressure and, consequently, the capillary pressure as well.

Lessening of the tissue tension assures the inflamed tissues of a more adequate oxygen supply.

The surgeon who uses conservative immobilization and posture will find that his patients will complain of less pain, that swelling will be more quickly reduced, that the necessity for incisions will occasionally vanish with the reduction of the swelling, that short incisions made for the evacuation of definitely established abscesses will do just as well as long incisions, and finally that with use of adequate immobilization and positioning of the extremity there will be less necessity for the external application of heat. Frequently the external application of heat is omitted entirely.

The value of this form of therapy is discussed in the treatment of acute osteomyelitis and suppurative arthritis.

In summary it is pointed out that the patient must himself fight out the battle with the invading organisms and that all the surgeon can do is to support the patient in the conflict. HARVEY S. ALLEN, M.D.

Sehrt, E. Tetanus (Der Wundstarrkrampf). *Med Welt*, 1937, p. 1773.

Tetanus is still a problematic sickness. It is controlled by the channels that circulate the toxin and antitoxin. After tetanus toxin is once firmly ensconced in the ganglion cells of the central nervous system, it is then irreversible. However, the changes caused by the toxin in the ganglion cells are repairable. The toxin travels exceptionally rapidly to the ganglion cells of the anterior horns of the spinal column along the lymphatics of the axis cylinders of the motor nerves. Only in the very early cases can the antitoxin counteract the toxin in the peripheral tissues, as the toxin travels faster than the antitoxin. Observations covering the blood plasma, the cerebral blood, and the membranes enveloping the blood of the brain are as follows: tetanus-antitoxin does not spread through the blood plasma, nor the membranes of the brain, but travels through the cerebral blood channels only. Is tetanus a spinal-cord, or a cerebral illness? Absolutely, the latter. The proofs are trismus and risus sardonicus (which are brain nerve symptoms), the rheumatoid pains located in the area of the original infection which no surgeon dares disregard, the local muscle contractions near the source of the infection, the fact that high division of the main nerve cord will stop these muscle contractions, and the possibility that the cramps may be controlled by means of acoustic and optic cerebral stimulation.

During the World War Sehrt was able to establish, by means of many sections, that in contrast to the usual negative findings, there always was a monstrous almost strictly localized edema of the

hypophysis and its contiguous area in these cases. This also proves that antitoxin circulates only by way of the cerebral blood vessels. The boundary level of this barrier lies in the capillaries, in the membrana limitans perivascularis of the cerebral vessels, and these are absent in the pituitary body, as proved by dye tests. This is an important point therapeutically, it shows that the intravenous injection of tetanus serum is the only efficacious method of treatment. The proposed method of injecting the serum into the subdural space, or into the lateral ventricles of the brain after trepanation is fallacious as the subdural space is firmly separated from the subarachnoid space. Even if the injection would penetrate these spaces, it would have only a lumbar effect. The latter is justifiable only when the antitoxin is injected immediately after the infection, or, at most, during the first hours after the infection, by the lumbar route, in order to counteract the rapidly diffusing toxin before it reaches the cerebrum.

Sehrt appends an interesting clinical history. The patient sustained a skin infection of the thumb. This was treated to a certain degree, at intervals. The prophylactic injection was given seventeen hours after the injury. The initial maddening rheumatoid pains spread from the site of injury, and local muscle cramps ascended along the radius. After sixteen days dysphagia occurred, and, later, cramps of the abdominal musculature and then opisthotonos appeared. The patient was cured by means of 105,500 units of antitoxin given intravenously and 44 cgm of morphine (given twice daily, 0 or Morph + 0.0005 atropin). The author recommends very high doses of morphine and states that tetanus patients are exceptionally tolerant to morphine. (He mentioned Pirquet, who in 1840 cured a case of tetanus with 250 cgm of morphine within a period of five days.)

As a sequel in Sehrt's patient, there was unbearable pain in the cicatrix for four weeks. This was relieved only after exarticulation of the distal phalanx of the thumb. Although animal experiments with cicatricial tissues were negative, Sehrt believes he should mention that perhaps many pains are caused by tetanus infections, even though tetanus can not be demonstrated clinically.

An interesting feature of Sehrt's patient was the fact that during the tetanus illness there occurred a hypofunction of the thyroid gland with an increase during the attacks demonstrable by rapidity of the blood coagulation, and changes in the blood picture similar to those in eclampsia. Evidently the thyroid gland plays an important part in muscle cramps in both of these conditions. The author calls attention to the fact that the still prevalent opinion that tetanus serum has little curative effect in markedly developed tetanus is erroneous. The physician should not hesitate to give from 500,000 to 1,000,000 units of antitoxin. As a result of this treatment there were only 214 deaths (less than 50 per cent) in 438 cases of Yodhs (Bombay). Finally, Sehrt considers the daily heavy doses of morphine during the attack.

absolutely superior to chloroform and probably also to avertin narcosis

(FRANZ) MATTHIAS J SEIFERT MD

Toomey J A The Prognosis and Treatment of Erysipelas *Ann Int Med* 1938 12 166

Prior to 1926 the treatment of erysipelas was not specific. After the introduction of erysipelas antitoxin by Birkhaug in May 1926 various reports appeared. It was claimed that with the use of antitoxin the general appearance of the patient became better, the temperature and pulse rate dropped, the length of time the patient was ill was decreased, there were no extensions, the toxicity definitely diminished within from twelve to eighteen hours after injections, there was a rapid disappearance or fading of the lesion and absorption of the pitting edema, and the mortality rate was decreased.

The author's report on the therapy of erysipelas is only preliminary, but it is sufficiently complete to enable him to state that his patients have not responded in like manner. Patients with uncomplicated erysipelas who had merely a localized lesion without extensions were ill from about two to fourteen days. The average was about seven days. The majority of the patients and controls in his series that recovered began to show improvement in their condition between the fifth and eighth days. Unless complications arise it is unusual for the patient to be acutely ill longer than for this length of time. When spread occurs it may take as long for the new lesion to clear up as the original one. Many patients are not sick for even a period of five or eight days.

Approximately 50 cases were treated experimentally with antitoxin and various amounts of prontosil (sulfamidamide) before the author finally began to treat erysipelas with this drug alone. All patients save those with hepatitis increasingly severe nephritis or sensitivity to sulfamidamide are now being treated in the following way:

The dose for the first twenty-four hours is computed on the basis of 1 gr of sulfamidamide per pound of body weight. One half of the total dose is given at once and the other half is given in divided doses over the first twenty-four hour period. Each succeeding day until the drug is discontinued the patient is given $\frac{1}{2}$ gr per pound of body weight.

All but 2 patients have received this drug by mouth and infants and patients in delirium are given it by means of the stomach tube. Two patients were injected with the drug subcutaneously. When the drug was injected subcutaneously 75 gr (5 gm) were added to 625 cc of saline and the whole was given as an infusion. All such doses are modifications of those suggested by Long and Bliss. Rarely need this drug be given for more than four days unless there are local abscesses in addition to the erysipelas. Blood counts and hemoglobin estimations must be made daily and as soon as 400 gr have been given the patient should be carefully re-examined.

With antitoxin the results were questionable save in the infant group. With sulfamidamide they seem definite. Seventy-two of 76 patients thus treated with the latter have recovered and 3 have died, a mortality rate of 4 per cent.

With the use of sulfamidamide the lesions of erysipelas become dusky red and purple within the first twelve to twenty-four hours and disappear completely within from four to ten days. The inflammatory reaction is likewise gone and the patient is subjectively better within from twelve to twenty-four hours. No patient has had massive local desquamation following this treatment. The temperature comes down in a few days and usually by lysis. Only 2 of the patients had a spread of the lesion. However there was only one spread in each instance and a very light one.

The author concludes that if his experience with sulfamidamide becomes general it will become the drug of choice in this condition. In patients with hepatitis or sensitivity to sulfamidamide antitoxin may be tried on the basis that it can't do much harm and might do some good. JOHN H GARLOCK MD

Snodgrass W R Anderson T and Rennie J L
Sulfamidochrysoidine Sulfamidamide and Benzylsulfamidamide in Erysipelas *B M J* 1938 2 399

This is the third of a series of articles on chemotherapy in erysipelas by Snodgrass and his associates at the Ruchill Fever Hospital in Glasgow. Each article has been based on a series of cases sufficiently large to allow the drawing of statistically significant conclusions and in each series a measure of scientific control unusual in this type of clinical study has been employed.

In the first series of 312 cases it was shown that sulfamidochrysoidine (prontosil) in erysipelas was better than ultraviolet light for controlling the spread of infection, the duration of pyrexia and the duration of toxemia. In the second paper the same conclusions were advanced for sulfamidamide when compared to ultraviolet light. In this third report the authors establish a scientific basis for the election of a chemotherapeutic agent and dose in treating erysipelas.

Two hundred and forty patients were divided into 8 groups of approximately 30 patients each. Every patient in one group received 10 gm of benzyl sulfamidamide and in a second group 20 gm of benzyl sulfamidamide every four hours. Four groups were treated with sulfamidamide, the doses being 0.5 gm, 0.75 gm, 1.0 gm and 2.0 gm four hourly. The last 2 groups received sulfamidochrysoidine in doses of 1.0 and 2.0 gm respectively every four hours. Patients were assigned to groups in rotation as admitted. The results of the various types of treatment are tabulated with regard to the effects of each drug or dosage on certain aspects of erysipelas. Spread of the lesion was most rapidly checked by sulfamidamide with sulfamidochrysoidine only slightly less effective. The duration of primary pyrexia

was about the same in each of the groups, about 75 per cent of the patients in each group having normal temperature within forty-eight hours. Duration of the toxemia was shortest when sulfamidochrysoidine was used, but the authors recognize the possibility that the slightly longer period of toxemia in the sulfanilamide groups might have been due to mild drug intoxication rather than to the disease itself. There were no recurrences with any of the drugs used, which finding was in contrast to the rather high incidence of recurrence among patients treated with other methods. The incidence of suppurative complications and thrombosis was only 6.6 per cent among the patients treated with sulfanilamide compared to 13.8 per cent in the other groups. The death rate in the entire group was 2.06 per cent, which is about one-fourth the average mortality rate of erysipelas in the Ruchill Fever Hospital for the period from 1931 to 1935, when chemotherapy was started. The incidence of toxic effects was far higher with sulfanilamide than with the other two drugs, but the authors have included mild cyanosis as a toxic effect, and this one factor accounted for most of the toxicity in the patients treated with sulfanilamide. The authors do not look upon cyanosis as a contraindication to continued therapy. They conclude that sulfanilamide or sulfamidochrysoidine may be employed with an approximately equal effect in erysipelas, but that benzylsulfanilamide is definitely less effective.

After taking into account all of the data, the authors recommend the following dose schedules: sulfanilamide 1.0 gm. every four hours until cure is established, then 1.0 gm. three times daily for fourteen days. With sulfamidochrysoidine the dose should be 1.5 gm. on the same schedule, with 1.0 gm. thrice daily for the fourteen days after recovery.

JOHN LOCKWOOD, M.D.

ANESTHESIA

Rocher, Philip, Got, Pouyanne, and Dupin. *Anesthesia in Children* (Les anesthésies chez l'enfant). *J. de méd. de Bordeaux*, 1938, 115, 33.

The authors sent out a questionnaire to surgeons, orthopedists, and otorhinolaryngologists in various countries, in regard to the choice of anesthetics employed in operations on children. The answers are divided into two groups: those furnished by general practitioners and those furnished by otorhinolaryngologists.

In the last mentioned group the majority of authors are opposed to general anesthesia in operations of long duration on the newborn or nursing.

Some surgeons employ local anesthesia, using ethyl chloride spray or a novocaine infiltration while others advocate nitrous oxide and oxygen or chloroform. The majority of workers are against general anesthesia, as they fear syncope and especially the so-called pallor-hyperthermia syndrome which, as its name implies, consists of a rise of temperature to 104.9°, pallor of the face, and complete prostration

appearing from six to twenty hours after the operation, especially in an intervention on the face. Sometimes the symptoms subside but in the majority of the cases the temperature climbs as high as 107.6° and death ensues after from twelve to sixteen hours. In the course of this syndrome the alkaline reserve and the arterial pressure fall and a marked dehydration takes place. This syndrome never appears before the fourth day of life and is most frequently observed at the age of from six days to six months. Occasionally the same syndrome may occur after surgical intervention without any anesthesia. In reality the syndrome is due to a cardiac syncope.

Numerous surgeons abstain from the use of any anesthesia in children from one to five years of age if a short operation is intended, in order to avoid cardiac syncope and the danger of aspiration of the blood or lymphoid debris by the respiratory organs as a result of the loss of reflexes. Others use either heated or frozen ethyl chloride given through a tube or by a closed method. Interventions on the bronchi or the esophagus may be done under local but never under general anesthesia. Mastoid operations are performed most frequently under general anesthesia, supplemented, if so desired, by a retro-audicular infiltration with novocaine and adrenaline. Chloroform is used very generally by otorhinolaryngologists. In children from five to fifteen years of age a local or a combined local and regional anesthesia is becoming more popular. The older the child above five years, the more popular the local anesthesia.

Ethyl chloride and nitrous oxide share their popularity among the ear, nose, and throat specialists for operations of short duration, while for longer procedures chloroform, ether, balseform, and nitrous oxide are used with approximately equal frequency.

As to the second group, the answers from general surgeons, there is a concurrence of opinion that the newborn should be operated upon without any anesthetic. In operations for conditions such as spina bifida and imperforate anus, local anesthesia may be employed. Hypertrophic pyloric stenosis also requires a local anesthetic, while a harelip is operated on under chloroform, by the intubation method. For older children ether is recommended by the great majority of surgeons, but some are using chloroform, Schleich's mixture, balseform, and rectal ether anesthesia. The ratio of cases in which ether has been used to cases in which other methods, such as spinal, local, epidural, or rectal anesthesia have been used was 2:1.

JOSEPH K. NARAT, M.D.

Cordier, D., and Soulié, P. *The Influence of Some Basal Anesthetics on the Saturation Curve of the Hemoglobin and the Ether-Soluble Acids of the Arterial Blood During Anesthesia in the Dog* (Influence de quelques anesthésiques de fond sur la courbe de saturation de l'hémoglobine et les acides éther-solubles du sang artériel au cours de la narcose chez le chien). *Anes. et anal.*, 1938, 4, 285.

Four types of anoxia may occur in the course of anesthesia. Anemic anoxemia appears in the anesthetized subject when the red cells are deficient in

absolutely superior to chloroform and probably also to avertin narcosis

(FRANZ) MATHIAS J SEIFERT MD

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Prior to 1926 the treatment of erysipelas was not specific. After the introduction of erysipelas antitoxin by Birkhaug in May 1926 various reports appeared. It was claimed that with the use of antitoxin the general appearance of the patient became better, the temperature and pulse rate dropped, the length of time the patient was ill was decreased, there were no extensions, the toxicity definitely diminished within from twelve to eighteen hours after injections, there was a rapid disappearance or fading of the lesion and absorption of the pitting edema, and the mortality rate was decreased.

The author's report on the therapy of erysipelas is only preliminary, but it is sufficiently complete to enable him to state that his patients have not responded in like manner. Patients with uncomplicated erysipelas who had merely a localized lesion without extensions were ill from about two to fourteen days. The average was about seven days. The majority of the patients and control in his series that recovered began to show improvement in their condition between the fifth and eighth days. Unless complications arise it is unusual for the patient to be acutely ill longer than for this length of time. When spread occurs it may take as long for the new lesion to clear up as the original one. Many patients are not sick for even a period of five or eight days.

Approximately 50 cases were treated experimentally with antitoxin and various amounts of protylin (sulfanilamide) before the author finally began to treat erysipelas with this drug alone. All patients save those with hepatitis increasingly severe nephritis or sensitivity to sulfanilamide are now being treated in the following way:

The dose for the first twenty-four hours is computed on the basis of 1 gr of sulfanilamide per pound of body weight. One half of the total dose is given at once and the other half is given in divided doses over the first twenty-four hour period. Each succeeding day until the drug is discontinued the patient is given $\frac{1}{2}$ gr per pound of body weight.

All but 2 patients have received the drug by mouth, and infants and patients in delirium are given it by means of the stomach tube. Two patients were injected with the drug subcutaneously. When the drug was injected subcutaneously 75 gr (5 gm) were added to 625 cc of saline and the whole was given as an infusion. All such doses are modifications of those suggested by Long and Bliss. Rarely need this drug be given for more than four days unless there are local abscesses in addition to the erysipelas. Blood counts and hemoglobin estimations must be made daily and as soon as 400 gr have been given the patient should be carefully re-examined.

With antitoxin the results were questionable save in the infant group. With sulfanilamide they seem definite. Seventy-two of 76 patients thus treated with the latter have recovered and 3 have died, a mortality rate of 4 per cent.

With the use of sulfanilamide the lesions of erysipelas become dusky red and purplish within the first twelve to twenty-four hours and disappear completely within from four to ten days. The inflammatory reaction is likewise gone and the patient is subjectively better within from twelve to twenty-four hours. No patient has had massive local desquamation following this treatment. The temperature comes down in a few days and usually by lysis. Only 2 of the patients had a spread of the lesion. However, there was only one spread in each instance and a very slight one.

The author concludes that if his experience with sulfanilamide becomes general it will become the drug of choice in this condition. In patients with hepatitis or sensitivity to sulfanilamide antitoxin may be tried on the basis that it can't do much harm and might do some good. JOHN H GARLOCK MD

Snodgrass W R Anderson T and Rennie J L Sulfamidochrysoidine Sulfanilamide and Benzylsulfanilamide in Erysipelas *Br J J* 1935 2 399

This is the third of a series of articles on chemotherapy in erysipelas by Snodgrass and his associates at the Ruchill Fever Hospital in Glasgow. Each article has been based on a series of cases sufficiently large to allow the drawing of statistically significant conclusions and in each series a measure of scientific control unusual in this type of clinical study has been employed.

In the first series of 312 cases it was shown that sulfamidochrysoidine (prontosil) in erysipelas was better than ultraviolet light for controlling the spread of infection, the duration of pyrexia and the duration of toxaemia. In the second paper the same conclusions were advanced for sulfanilamide when compared to ultraviolet light. In this third report the authors establish a scientific basis for the selection of a chemotherapeutic agent and dose in treating erysipelas.

Two hundred and forty patients were divided into 8 groups of approximately 30 patients each. Every patient in one group received 1.0 gm of benzyl sulfanilamide and in a second group 2.0 gm of benzylsulfanilamide every four hours. Four groups were treated with sulfanilamide, the doses being 0.5 gm, 0.75 gm, 1.0 gm and 2.0 gm four hourly. The last 2 groups received sulfamidochrysoidine in doses of 1.0 and 2.0 gm respectively every four hours. Patients were assigned to groups in rotation as admitted. The results of the various types of treatment are tabulated with regard to the effects of each drug or dosage on certain aspects of erysipelas. Spread of the lesion was most rapidly checked by sulfanilamide, with sulfamidochrysoidine only slightly less effective. The duration of primary pyrexia

and Paraf employ the transverse process of the seventh cervical vertebra, and Demarez that of the first dorsal vertebra, as a guide for the introduction of the needle. The authors regard this posterior route as better suited for the infiltration of the thoracic chain than for access to the stellate ganglion.

A new technique has been developed by Leriche and Arnulf, who employ the supero-external route. The aim of this method is to follow the stellate ganglion with the needle along its longitudinal axis. For this method, it is important that the plane of the transverse processes of the upper vertebrae be determined by palpation, but it is not necessary that the transverse process of the seventh cervical vertebra be located exactly. The needle is introduced at a point approximately 5 cm directly above the meeting point of the median and the inner third of the clavicle, this is usually at the angle formed by the external border of the sternocleidomastoid muscle and the external jugular vein, for a patient with a short neck this point is above the external jugular vein. The needle is introduced in a slightly oblique direction from above downward and from in front backward, until it contacts a vertebral transverse process, usually that of the seventh cervical. The handle of the needle is then inclined upward at an angle of 60 degrees. The needle is directed downward along the vertical axis of the transverse process, the anesthetic solution being injected continuously as the needle advances. The surgeon can introduce the needle from 8 to 10 cm, stopping occasionally, and aspirating slightly to determine whether any blood has entered the needle. Then from 10 to 15 cm of the novocaine solution are injected. The needle is kept in place until the Bernard-Horner syndrome and hyperthermia of the arm and hand on the side of injection develop, which are signs that the anesthetization of the ganglion has been obtained. These phenomena are of short duration. In the removal of the needle a little more of the novocaine solution may be injected. The total amount used is 20 c cm.

The authors consider this technique to be the most satisfactory as a rule, the introduction of the needle along the vertical plane of the transverse processes and in a slightly oblique direction from without inward gives good contact with the stellate ganglion

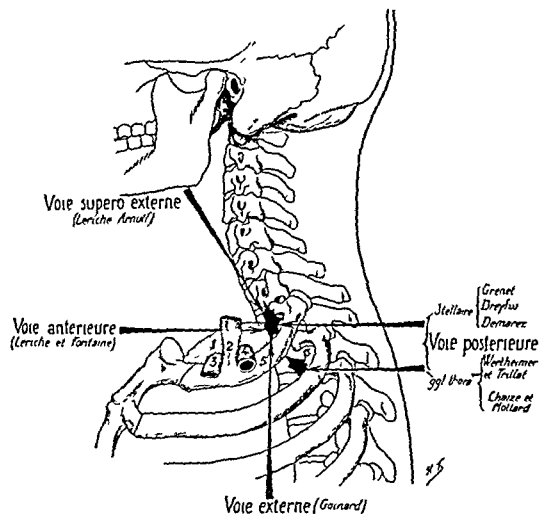


Fig 1 Schematic illustration of the various routes of approach to the stellate ganglion and the upper thoracic chain 1 The dome of the pleura 2 The tendon of the scalenus muscle 3 and 4 Subclavian vessels 5 First rib 6 Thoracic chain (upper thoracic ganglion)

and also with the innermost portion of the thoracic chain. The danger of any damage to important organs and vessels is reduced to a minimum, because of marked variations in its anatomical position, the pleura may be punctured, but this occurrence is more annoying than dangerous.

Whichever method is chosen for anesthetization of the stellate ganglion, it should be remembered that this procedure is a true surgical procedure, it cannot be carried out without all precautions used in major surgery. Each surgeon will probably choose the technique in which he is most experienced, but no one technique should be used in all cases to the exclusion of the others. The posterior route, for example, can be used to good advantage in dyspneic and asthmatic patients, the anterior route is best suited to thin patients with angina. In other cases the superior external route gives the best results.

ALICE M. MEYERS

numbers or are prevented from exercising their natural function. The action of volatile anesthetics on hemoglobin has been studied especially and a combination between hemoglobin and chloroform has been admitted as well as the formation of methemoglobin both of which decrease the respiratory function of the blood. Chloroform diminishes the affinity of the red cells for oxygen and ether reduces the oxygen fixation speed of hemoglobin. On the other hand the study of the respiratory function of the blood with regard to basal anesthetics has hardly been started. A decrease in the hemoglobin of the blood has been found in the dog anesthetized with avertin and a slight anemia has been noted in man when he is anesthetized with evipan and avertin while severe anemia has been reported in animals after several consecutive anesthetics with evipan.

The authors have used rectanol narcosol and evipan to study the saturation curve of hemoglobin in dogs and have determined at the same time the rate of total ether soluble acids in the blood. The blood was obtained by arterial or cardiac puncture before and during anesthesia and was debarbitalized before use. Rectanol (a solution of tribromethanol in amylene hydrate) was administered rectally in 2 dogs and intraperitoneally in 1 dog at high dosage. The determinations showed that this drug did not decrease the affinity of the red cells for oxygen and that the rate of the total ether soluble acids was changed very little. Narcosol (a sodium derivative of ethobutyl ethylmalonyl urea) was injected intravenously in 1 dog and evipan in 2 dogs at high dosage. The determinations showed that these barbituric acid derivatives had only a very slight action on the affinity of the red cells for oxygen and that the rate of the total ether soluble acid remained practically unchanged.

RICHARD KEMEL M D

Goinard P. Regional Anesthesia by the Arterial Method (Anesthésie régionale par voie artérielle)
Ann. Chir. 1935 4 361

The intra arterial method of anesthesia is indicated for surgery of the extremities when other usual methods of anesthesia are contraindicated because of the presence of a grave pulmonary lesion, a hepato renal lesion or arterial hypotension.

A 1 per cent solution of novocaine has been used most satisfactorily for this method. The dose of novocaine varies between 20 and 40 cgm according to the size of the superior or inferior extremity. The addition of adrenaline to the novocaine solution has been discontinued in consideration of extensive experience with such anesthetics.

The technique of injection is as follows: transcubital puncture of the artery or cutting down directly to the artery to be anesthetized is carried out proximal to the site of the operation. A constrictor proximal to the site of injection stops the venous circulation alone or both venous and arterial flow may be stopped by greater pressure. A simpler method is to use two sterile pieces of rubber tubing at the extremities of the segment to be anesthetized.

The results obtained are very favorable. Anesthesia is complete within a few minutes and it is a true anesthesia not an analgesia. The anesthesia lasts as long as the rubber constrictors are satisfactorily in place and even several minutes after the compression rubber bands have been removed. Postoperative pain in the member is practically unknown and many patients have been able to sleep the first night without a hypodermic or sedative. Troublesome postoperative hemorrhage or ischemia has not been observed after arterial anesthesia.

The effect of the novocaine upon the system as a whole when it is allowed to flow back through the veins is not unfavorable. The arterial blood pressure does not change and there is no syncope at most there is a slight intoxication with euphoria. There were no accidents either local or general in twenty two months of observation. Several patients were subjected to this type of anesthesia several times.

The author wishes to emphasize the fact that arterial anesthesia which has been found so efficient and so devoid of dangers is not an anesthesia of minor importance however it should be used only in surgery of the extremities when all other usual anesthetic methods are contraindicated.

RICHARD J. BENNETT JR. M D

Nichon L. and Frieß P. Technique for Anesthesia of the Stellate Ganglion (Technique de l'anesthésie du ganglion étoilé)
Ann. Chir. 1935 4 339

Various routes have been employed for infiltration of the stellate ganglion with an anesthetic. Whichever route is selected a long platinum needle from 8 to 10 cm long and 0.6 mm in diameter and a solution from 1/100 to 1/200 of a cocaine derivative are employed. A small amount of the anesthetic should also be used for anesthetization of the skin at the site of injection.

The anterior route for the infiltration of the stellate ganglion was first described by Leriche and Fontaine in 1934. With this technique the needle is introduced at the upper border of the middle of the clavicle in the direction of the apophysis of the seventh cervical vertebra. The authors consider that this technique is difficult and does not always give a satisfactory infiltration of the ganglion. Puncture of the pleura is a possible complication.

The lateral external route was described by Goinard in 1936. With this technique the first rib must be located and the needle introduced in the region of the anterior border of the trapezius muscle at an angle of 45 degrees in the direction of the rib. This method the authors note may be carried out successfully in thin patients but is not suitable for obese or very muscular subjects.

The American school represented by Adson, Brown and White employ the posterior route for access to the stellate ganglion. The posterior route has also been employed in France. Dreyfus, le Foyer and Faraf and Demarez have recently (1937) described their techniques for this method. Dreyfus

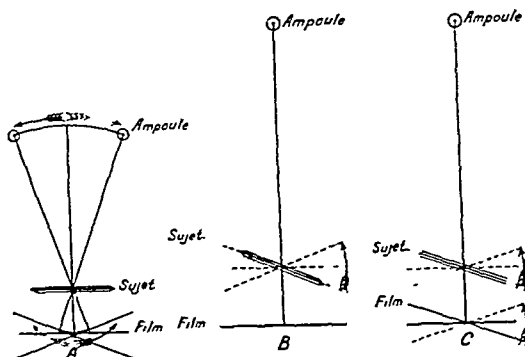


Fig 1

Fig 1 (a) First method of Vallebona The ampoule and the film are displaced in inverse sense, around an axis passing through the "section" of the subject The subject remains fixed

(b) Second method of Vallebona The ampoule, placed at 2 m, and the film remain fixed The subject oscillates around an axis passing through the subject in stratigraphy

(c) Modification proposed by Bozzetti The ampoule, at 2 m, remains fixed The subject and the film, which are parallel, oscillate at the same time

and "stratigraphy" in Italy to signify roentgenological analysis of the organism by sections This method is used for effacement of the parasite shadows and dissociation of the superimposed planes It permits exploration and isolation of the successive cuts of the organs to be examined

In the original method of Vallebona, both the roentgenographic tube and the film were displaced, the subject remaining fixed In the second method of Vallebona, the roentgenographic tube is placed at 2 m and the film remains fixed, the subject turns about a fixed axis (Fig 1)

With modifications proposed by Bozzetti, the roentgenographic tube is at 2 m and remains fixed, the subject and the film, which are parallel, oscillate at the same time (Fig 1)

The French modification is the oscillo-strator of Ronneaux and Lemoine consisting of an oscillating platform on which the patient stands with his back supported against the mobile back to which he is fastened by straps This permits advancing the patient between the uprights of a frame fixed on the axial plane of rotation in which one brings the "cut" of the lung which one desires to study A film carrier is placed in front of the patient at a fixed distance of 30 cm It is joined to the frame by an articulation which renders it solid while rotating The whole operation of rotation and taking the roentgenogram may be controlled mechanically A distance of 2 m, from 60 to 80 ma, and a time exposure of from 1/10th to 1/4th of a second are used, an angle of 20 degrees has been found to be most satisfactory

The value of the stereoscopic plates is not questioned but may be regarded as a complement to the



Fig 2 The apparatus of Vallebona

stratigraphy The stratigraphy is above all an analytical method for the exploration of images and is of the greatest benefit when the clinical findings are in discord with the classical roentgenography

Stratigraphy confirms the existence of cavity images of the apices of the lung Lesions of the base of the lung and at the hilum, such as small areas of bronchopneumonia, unsuspected atelectasis, arterial intercrossings, bronchiectasis, polycystic images, congenital cysts, and air cysts, which may be invisible in the regular roentgenogram, are quite easily discovered with stratigraphy

In certain cases in which half of the thorax is opaque and examination or diagnosis is therefore impossible, stratigraphy is found quite useful In a study of a chest of this type, a fibrothorax which may have been thought complete proves to be only partial Excavated lesions are ruled out and the presence of pulmonary infiltrations and of liquid or gaseous effusions is ascertained

Stratigraphy is valuable in thoracoplasty for the study of the pre-operative conditions and the post-operative course Sclerosis, pleural thickening, repair in sectioned ribs, and the like are shown quite well When artificial pneumothorax is used the postoperative course may also be followed, and the adhesions and the condition of the cavity which was intended to be collapsed may be determined

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Leitner Z A The Physical and Biological Basis of Grenz Ray Therapy *Brit J Radiol* 1938 11 580

Grenz rays are generated at from 6 to 12 kv. Their spectral distribution and intensities both absolute and relative vary with the voltage. Because of the softness of the radiation the filtration of the air is of importance.

Because of variations in thickness of the Lindemann glass window itself a filter the relation of it to the air lying between the focus and skin is different for every focus skin distance. It is therefore necessary to ascertain the quality of the rays for every focus skin distance of every tube. This measurement is usually made in half value layers of aluminum.

Grenz rays are absorbed almost entirely in the skin and by taking into consideration the mean atomic weights of the different skin layers and their corresponding absorption coefficients the author finds that their intensity is reduced to about 40, 20 and 12 per cent of the initial value through absorption in 1, 2 and 3 mm of skin respectively.

The action of Grenz rays in surface lesions is probably due to absorption of physical energy in the affected area while their influence on distant or generalized conditions is probably secondary to an effect on the vegetative nervous system. Originally Bucky believed that Grenz rays produced biological phenomena intermediate between those of the roentgen and ultraviolet rays.

The author has investigated the possibility of a correlation between the biological action of Grenz rays and their ionization of air as measured with the Siemens dosage rate meter equipped with a special Grenz ray ionization chamber. There is not yet agreement on all points among the various workers but in general the biological effects of Grenz rays run parallel to the ionization of air.

Ionization figures as an index to erythema are variable for Grenz rays. Among 9 different authors the figures varied from 100 to 1380 roentgen units. The author irradiated with Grenz rays which were generated with 9, 10 and 12 kv and used on small fields the anterior forearms of 6 patients and studied the reactions by frequent observations and the use of Wood's filter and the capillary microscop. He found erythema appearing as early as forty eight hours after the application of 100 roentgen units. With increasing hardness of the rays erythema is produced by smaller doses this action apparently being a reflection of their deeper action. In comparing the appearance of the first erythema it was found that the latent period decreases as the dose increases the quality of the rays being constant. With doses of more than 2000 roentgens there is practically no

latent period with doses upward of 300 roentgens usually a second wave appears and with doses of 600 roentgens and upward a third wave appears. The application of 100 roentgens is usually followed by desquamation which is marked after 1200 roentgens. The third wave of erythema is always followed by pigmentation usually more marked than that which follows roentgen irradiation.

The quality of the rays is very important in the production of the main erythema the wave being higher and longer for harder radiation but it does not influence the latent period. The degree of erythema varies with each individual the variation sometimes being pronounced.

The author repeated the investigations of Hausser and Schlechter on the degree of erythema following Grenz irradiation and obtained a similar flat curve for the early erythema. Both he and Wilhelm, however, noted that the main reaction occurring from four to five weeks later shows a much more marked reddening comparable to that of medium hard x rays. It would seem therefore that there is only a quantitative difference between the x ray and Grenz ray curves of erythema and not a qualitative one as has been supposed since 1927.

Bucky and others have shown that the number of leucocytes in the peripheral blood is reduced by one third in from ten to thirty minutes after Grenz irradiation and that the original number is restored in from thirty to sixty minutes. A marked increase in the splanchic area following the irradiation is probably responsible for this change and the fact that no such response was obtained upon irradiation of a leg on which a sympathectomy had been done would substantiate this thought.

Grenz ray irradiation does not change the amount of sodium and phosphate in the blood it decreases the potassium considerably and the chlorine slightly and increases the alkali reserve and the cholesterol and the calcium slightly. There is an increased anionic deficit in the serum. In vitro no change in the acidity after irradiation of the blood or protein solution has been found. The blood sugar tends to fall.

Atrophy, telangiectasis and pigmentation are the most common forms of damage. Halz's data for the safe limits with rays of varying hardness were confirmed. However despite wide use not over a dozen cases of permanent damage are recorded. Permanent damage is caused not only by too large doses but mainly by too early repetition of the treatment.

ADOLPH HARTUNG M.D.

Ronneaux G The Pulmonary Stratigraphy of Vallebona (La stratigraphie pulmonaire de Vallebona) *Arch néd chir de l'appar respir* 1937 12 442

The term planigraphy is used in Holland tomography in Germany radiotomy in France

cysts were noted and there was no sign of calcification either in the musculature or in the soft parts of the trunk and extremities. A large number of parasites were found in the retroperitoneal fat. This localization may have influenced the function of the gastro-intestinal tract. A. Louis Rosi, M.D.

Barbieri, A : Experimental Roentgenological Research on the Intestinal Tract of *Ascaris* (Ricerche radiologiche sperimentali sul tubo digerente dell'*ascaris*) *Radiol med*, 1938, 25 745

The explanation of the cause of the x-ray shadows noted in connection with the presence of ascars within the intestinal tract has been the subject of much discussion. Illustrations are presented to show the various typical shadows. Those shadows which are noted in the study of patients who have not received contrast meals are usually the result of gaseous distention of the intestinal tract of the worm. Thus the worm appears as an elongated tube when visualized laterally and as a hollow disc or ring when visualized on end.

In patients who have received opaque meals the worms frequently are outlined by the same contrast substance which has gained access to the intestinal tract of the worm. The comparison of the shadows seen in patients with those produced experimentally in the isolated worms tends to corroborate the view that the ascars imbibe radio-opaque substances. The intestinal tract thus outlined may appear as a relatively straight ribbon-like or rod-like tube. Occasionally the margins may be scalloped, probably as a result of segmental contractions of the intestinal tract of the worm. A. Louis Rosi, M.D.

Ungerman, A. H., Vicary, W. H., and Eldridge, W. W. : Luetic Osteitis Simulating Malignant Disease. *Am J Roentgenol*, 1938, 40 224

Although syphilis affecting bone may exhibit definite pathological, clinical, and roentgenographic

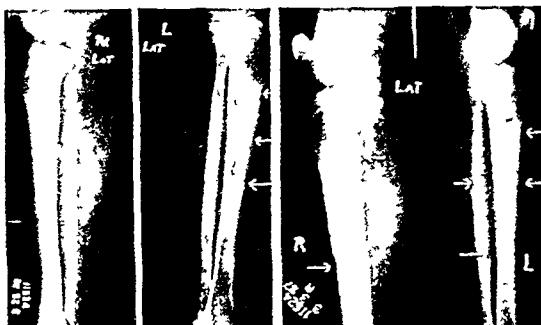


Fig 1

Fig 2

Fig 1 Arrows indicate some of the lesions discovered at the first examination. Additional areas were shown in postero-anterior views in this and in subsequent examinations.

Fig 2 Showing healing almost complete and first signs of bone production, indicated by periosteal thickening of the fibulae, approximately seventeen weeks after treatment was instituted.

characteristics, such is not always the case. In many instances the final diagnosis must rest on the therapeutic test. The differential diagnosis from non-specific osteomyelitis, periosteal sarcoma, osseous involvement with Hodgkins disease, and metastatic malignancy are discussed briefly. Stress is laid on the fact that bone production usually exceeds bone destruction in syphilitic lesions.

The authors report in detail a case in which certain of the usual clinical, pathological, and roentgenographic features of bone syphilis were lacking, and the impression gained was that of a malignant destructive process. Active anti-luetic therapy resulted in marked clinical improvement and subsequently the bone lesions presented a more or less typical roentgenographic appearance, characteristic of a syphilitic periostitis. ADOLPH HARTUNG, M.D.



In abscesses of the lungs the value of stratigraphy is rather inconstant. In tumors of the lung it may be of value for differential diagnosis.

Pulmonary diseases which will be benefited by stratigraphy are very numerous. This procedure is rather costly when several successive layers are taken and should not be used except when the classical roentgenological diagnosis has not been satisfactory. This method does not supplant classical radiography but there are many pathological lesions in which it is definitely indicated and in which it will be of value. It has the great advantage of being especially designed for roentgenological exploration of the lung in layers; it permits the use of simple material; is easy to handle and may be used as an accessory in all existing roentgenological installations.

RICHARD J. BENNETT JR. M.D.

Cottenot P. Results of One Year of Seriescopy (Résultats d'une année de sériescopie). *Arch. Méd. Ch. de l'Appar. Resp.* 1937 12 434.

Tomography and seriescopy find their most important indications at the present time in the study of affections of the pleura and of the lungs. Roentgenograms often give incomplete and false images of suspected lesions. In seriescopy 4 successive roentgenograms are taken which may be read at the same time when the depth of the different planes represented is known.

In one year the author has made 152 seriescopic examinations of the lungs. It was found that very few of the seriescopies were not usable in differential diagnosis. The diagnostic problems encountered and their results are discussed.

In the tuberculous lesions the findings were proved in a large proportion of the cases studied. Many

suspected cavities were brought out definitely in detail.

The seriescope has been of value in the differential diagnosis of a cavity from pleural thickening and the like. Images which have been impossible of interpretation by the usual procedures have been correctly diagnosed more often by seriescopy than by any other method. It has aided in the determination of the form, size and exact location of a cavity with a view toward therapeutic intervention.

Seriescopic study of therapeutic pneumothorax has been shown to be of value in that the progress of the change in the lungs and of the pathological lesions of the lung have been followed with accuracy. The determination of adherent bands and cavities in the neighborhood of these bands has been successful.

Seriescopy has been of value in operative control by means of thoracoplasty. The change in size and location of the lesions and other alterations may be followed serially. In some cases of thoracoplasty in which the sputum is still positive it has been shown that a fibrous shell has not collapsed and is responsible for the still positive expectation.

In the diagnosis of cancer of the lung the seriescope has not given a great deal of help in the way of diagnosis although in several cases neoplastic masses have been dissociated from the vasculobiliary shadow with which they had been confused.

Twenty one cases of abscess of the lungs have been studied. The size and depth of the abscess were determined in view of surgical intervention (Fig. 2).

The seriescope has in one year aided materially (1) in the diagnosis and treatment of lesions of the chest and most particularly in doubtful diagnoses; (2) in the exploration and location of lesions in view of surgical intervention; and (3) in the control of the results of therapeutic intervention.

RICHARD J. BENNETT JR. M.D.

Garretto U. The Roentgenological Picture of Non-Calcareous Muscular Cysticercus (Sul quadro radiol. di cisticerco muscolare non calcificato). *Arch. Med. Radiol.* 1938 25 607.

The roentgenological demonstration of calcified cysticercus in the musculature of the human being is not uncommon and is usually an accidental finding. The calcium is deposited in or about the cysts. The author studied a patient with a recent cysticercus infestation and believes that he was able to recognize the cysts roentgenologically before calcification had begun. He records the clinical history of the patient in detail and illustrates his descriptions with prints of roentgenograms showing the shot-like shadows representing the many cysts. The author believes that it was possible to distinguish the larval from the adult forms. The diagnosis was confirmed with biopsy. Roentgenological examination of the intestinal tract of this patient revealed a dysfunction probably due to the presence of parasites within the intestine.

Garretto notes that the patient died subsequently and necropsy was performed. Large numbers of



Fig. 1. Abscess of the left lung, seriescopic section parallel to the anterior costal plane.

cysts were noted and there was no sign of calcification either in the musculature or in the soft parts of the trunk and extremities. A large number of parasites were found in the retroperitoneal fat. This localization may have influenced the function of the gastro-intestinal tract. A. Louis Rost, M D

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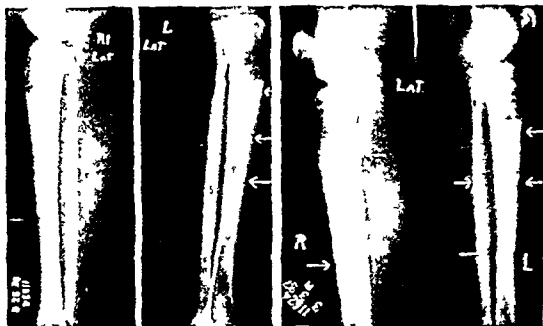


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MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Britton C J C and Howkins J The Action of Sulfanilamide on Leucocytes A Report on 50 Ambulant Patients *Lancet* 1938 233 718

Serum leucocyte counts were made on 50 ambulant women who had received 21 gm of sulfanilamide in fourteen days. The cases included normal controls, chronic cervical erosions without constitutional symptoms, chronic urinary infection with local symptoms only and localized acute gonococcal infection. In 46 per cent of the cases a transient polymorph leucopenia was noted and in 44 per cent a monocytosis. These changes were usually found between the seventh and twentieth day after administration of the drug. Toxic symptoms occurred in 70 per cent of the cases but bore no definite relation to variations in the white count. The mild leucopenia observed is considered significant in view of the small dosage of sulfanilamide.

WALTER H NADLER M D

McCarroll H R The Regeneration of Sensation in Transplanted Skin *Ann Surg* 1938 108 309

The author discusses the regeneration of sensation in a series of 58 cases of skin transplant. 45 split thickness grafts, 8 free full thickness grafts and 5 pedicle grafts. The patients ranged in age from five to fifteen years. The observations were first made five or six days postoperatively, continued daily for from one to two weeks and finally made at weekly interval until sensations in the area of the graft were equal to those of the normal skin. An algometer accurately calibrated was used for pain discrimination and a wisp of cotton for touch. Pain and temperature observations were not considered accurate enough to justify reporting. Two point discrimination was used in comparison of the graft to the normal skin. Previous observers had noted that the sensation returned from the margins toward the center of the graft but with the exception of the pedicle flaps in which sensation returned first along the proximal margin, the author noted simultaneous return throughout the area of the graft.

In 16 of the 45 split thickness grafts sensation returned to that of normal skin in sixty days or less. The nerves apparently grow upward from the base which accounts for the simultaneous return of sensation. The more dense the scar of the base the slower is the recovery. If the sensory nerve were destroyed by deep burns sensation sometimes never returned. If the nerve was destroyed to an area with sensory overlap the return of sensation was better than in areas without overlap as the forehead in which no return occurred.

In the 8 free full thickness grafts there was found a more rapid return of normal sensation than that

reported by previous observers but it was slower than the return in split thickness grafts. With but few exceptions in which the base was a very dense scar the rate of regeneration was shown to be equal throughout the graft. In 5 cases approximately sixty days elapsed before sensation was equal to that of normal skin.

The results in the 5 pedicle flaps compared favorably to those reported by other observers. Sensation returned first along the proximal margin and that which was first attached to the new bed. Recovery in the body of the graft started from the proximal and lateral margins in 3 cases. Normal sensation had returned in an average of 285 days.

A definite time dissociation between the return of pain and touch sensation was noted being more pronounced as the thickness of the graft increased.

BRADFORD CANNON M D

Clarke J M A Brief Review of Functional Hyperinsulinism with the Report of a Case *Australian & New Zealand J Surg* 1938 8 66

The author reports a case of probable functional hyperinsulinism greatly improved by partial pancreatectomy. The patient a man of thirty years complained of weakness which was relieved by food however the food in turn was apt to cause giddiness. He also complained of constant hunger, irritability and of occasional tonic contractions of the flexor muscles of the ulnar aspect of the forearm. The lowest blood sugar level recorded was 64 mgm per 100 c cm. The glucose tolerance curves were variable with 50 gm of glucose a maximum rise in the blood sugar to 148 mgm occurred at one hour while with 200 gm of glucose a maximum rise to 96 mgm was noted after two hours. Thirty five grams of pancreatic tissue were removed. Studies of the sections of the gland are not reported. After more than nine months great improvement was apparent but the tonic muscle spasms of the forearm continued. The author believes that removal of more pancreatic tissue might have produced even better results.

WALTER H NADLER M D

Schroeder E Five Cases of Primary Psoriasis (Circas de psoriasis primitives) *Acta chir Scand* 1938 81 139

Schroeder states that he was able to obtain the records of 5 cases of primary psoriasis from various hospitals of Copenhagen, Denmark. 2 of the cases he has observed personally. Four of the patients were children under fifteen years of age, 1 was eighteen years of age, 3 were males and 2 females. In a review of 56 cases of primary psoriasis reported in the literature the author found that 24 had occurred in children and 12 in adults, in 32 cases in which the sex was stated, 20 patients were males and 12 females.

In the 5 cases reported, there was a previous indirect trauma, a fall on the hip in 1 case, and a superficial infection (furunculosis) of the lower extremities which caused lymphangitis in another, no cause could be determined in the other 3 cases. One patient developed paratyphoid fever, but this was apparently an accidental complication, as the symptoms of psoriasis were well developed before the onset of the intestinal symptoms, and the Widal reaction did not become positive until late in the disease.

The characteristic symptom of psoriasis is flexion of the hip with inability to extend it, while other movements of the hip joint are not affected. In all the author's 5 cases, the left side was involved. As a rule the symptoms developed slowly, the patient began to limp, was unable to extend the hip, and complained of pain. Later the pain increased in severity, fever developed, and the patient was confined to bed with the hip in flexion. In 1 of the author's cases the onset was more acute with symptoms of general infection. The diagnosis was aided by roentgenographic examination, as this showed that the bone was not involved, and demonstrated the enlarged shadow of the psoas muscle. If intravenous pyelography is done it shows displacement of the kidney, as in 1 of the author's cases.

The milder cases of psoriasis may be treated by hot fomentations and extension of the limb. If an abscess forms, as is usually the case, incision for drainage is necessary, the incision is made parallel to the crest of the ilium as a rule and the sheath of the psoas muscle is opened to give access to the abscess.

Alice M. Meyers

DUCTLESS GLANDS

Garlock, J. H. The Differential Diagnosis of Hyperparathyroidism. *Ann Surg*, 1938, 108, 347.

In the twelve years that have passed since Mandl (at the suggestion of Erdheim) first removed a parathyroid adenoma in the case of a patient with hyperparathyroidism, the number of reported cases of this disease has increased considerably. Up to February, 1936, Wilder and Howell were able to collect 135 cases which, upon careful analysis, were unquestionably authentic instances of the disease. Undoubtedly, there have been many others which have not been reported.

The clinical, roentgenographic, and chemical aspects of hyperparathyroidism have been stressed so frequently in the past decade that the disease has become familiar to the medical profession at large.

It may be well, however, to again state that the various manifestations of hyperparathyroidism are dependent upon the secretory hyperactivity of one or more parathyroid adenomas which brings about a profound disturbance of the calcium and phosphorus metabolism, and that surgical removal of the tumor results in either complete cure or marked amelioration of the symptoms. The disease, which occurs more frequently in females and usually in

middle life, is generally measured in terms of years. It is characterized by bone and joint pain, muscle weakness, localized bone swellings, pathological fractures particularly of the extremities and ribs, disturbances of gait, and, in advanced cases, deformities of the bones. There may be other symptoms which become so prominent as to cloud the more important aspects of the clinical picture. These are attacks of intractable nausea and vomiting, polyuria and polydipsia, renal colic, anorexia, severe constipation, loss of weight, and secondary anemia.

The explanation of the roentgenological findings rests upon a knowledge of the disturbance of physiological activity of the parathyroid tumor. Normally, it is the function of the parathyroid bodies to control the calcium and phosphorus metabolism within the narrow confines of fairly constant blood-serum values of from 9.5 to 10.5 mgm of calcium per 100 c.c. and 3 to 3.5 mgm of phosphorus per 100 c.c. When parathyroid activity is increased, because of the presence of a hyperfunctioning tumor, the serum calcium level is increased and the phosphorus decreased, because greater quantities of calcium salts are withdrawn from the bones. Usually, increased phosphatase activity can be demonstrated. The effect of prolonged withdrawal of calcium salts from the skeleton becomes evident upon roentgenological examination. The bones of the skull present a finely granular appearance. The long bones appear porotic with thinning of the cortex and trabeculae. There may be cyst formation in the center of the shaft. The pelvic bones are frequently cystic. The vertebrae present a coarsely granular pattern similar to that seen in the skull. As a result of a softening of the skeleton, deformities occur with the gradual collapse of supporting structures such as the spine, pelvis, and thoracic cage.

Up to the present time, most observers have agreed that a diagnosis of hyperparathyroidism should be made when, in addition to the clinical symptoms and roentgenological findings already enumerated, there is found a hypercalcemia, a hypophosphatemia, an increase in the serum phosphatase, and a proved negative calcium balance. In fact, the combination of these laboratory findings is considered pathognomonic of the disease.

The author reports 2 cases of proved hyperparathyroidism. These patients returned to normal health following removal of a parathyroid adenoma. In contradistinction to these cases, he reports in detail the history of a patient showing all the laboratory and roentgenological findings of hyperparathyroidism. No parathyroid adenoma was found and biopsy of an involved bone showed the case to be one of polyosteoitic fibrous dysplasia, a condition described by Lichtenstein.

This disease is probably congenital, has a predominantly unilateral distribution, and affects primarily the medullary cavity.

The characteristic pathological features of polyosteoitic fibrous dysplasia appears to be a disturbed function or development of the bone-forming mesen-

chyma which results in replacement of the spongiosa and filling of the medullary cavity of affected bones by fibrous tissue in which trabeculae of poorly calcified primitive new bone are developed by osseous metaplasia. The seemingly complex histological picture becomes much easier to interpret if one predicates the multipotential capacity of this undifferentiated fibrous tissue. The latter normally gives rise to the spongiosa and to the myeloid or fatty marrow but under pathological conditions it may develop in several anomalous ways. By osseous metaplasia it gives rise to osteoid and primitive fiber bone. By cartilaginous metaplasia it gives rise to sporadic isolated islands of hyaline cartilage which tend to become calcified. By fibroblastic differentiation it gives rise to mature collagenous connective tissue. Finally by coalescence of its nuclei it may give rise to multinuclear cells indistinguishable from osteoclasts. Whatever stimulates the continued perverted activity of the undifferentiated fibrous bone forming mesenchyma or initiates the disorder remains a matter of conjecture. The clinical history of symptoms dating back to early childhood strongly suggests a congenital basis for this curious anomaly.

Finally the author suggests that the surgeon when confronted with suspicious bone lesions evident in the roentgenograms and with serum estimations of calcium and phosphorus which are outside the normal limits (in spite of the fact that calcium metabolism studies may show a negative balance) should not be too hasty to advise exploration of the neck for a parathyroid adenoma. It is suggested further that when doubt exists as to the diagnosis additional investigation should be undertaken to clarify the situation. This consists of roentgenological examination of the skeleton to determine whether the bone lesions have a predominantly unilateral distribution and the performance of a bone biopsy. The latter will definitely establish the diagnosis by differentiating the characteristic histo-

logical pictures of polyosteoitic fibrous dysplasia from hyperparathyroidism.

De Donno E. Experimental Research on the Influence of the Prolonged Administration of Hormone from the Anterior Pituitary Lobe and of Prolan on the Vital Organs of Normal and Ovariectomized Animals (Ricerche sperimentali sull'influenza della prolattina sommatropica e del prolano prepuberale e di Prolan su organi vitali della cavia normale e ovariectomizzata). *Ginecologia* Torino 1938 4 403.

The author lists a large series of isolated observations on the histological changes in certain organs following the administration of hormone from the anterior lobe of the hypophysis and prolactin. The cortex of the suprarenal gland of the castrated female animal which received no treatment and was killed twenty-eight days after castration appeared normal. In the castrated female animal which received 1400 units of prolactin for twenty-one days and was then sacrificed the suprarenal cortex was very much thickened; there was some degeneration and congestion of the cells and the medulla was reduced in size. In the castrated animal treated with hormone from the anterior pituitary lobe the modifications in the suprarenal gland increased proportionally with the amount of treatment. The cortex was thickened, vacuolated and in some places even spongy. In normal animals treated with this hormone the changes in the cortex were not as marked as in the castrated animals.

The only series of animals in which there was significant change in the pancreas was that in which the animals were castrated and treated with prolactin. In these animals there was degenerative change and vacuolization and after more prolonged treatment some congestion.

The liver undergoes the most marked changes in the castrated animals which are treated with the hormone. Changes in the lungs, heart, spleen and kidneys are of less importance. A. LOUIS ROSE, M.D.

INTERNATIONAL ABSTRACT OF SURGERY

APRIL, 1939

PRINCIPLES OF SURGICAL PRACTICE

THE PREVENTION OF POSTOPERATIVE PULMONARY COMPLICATIONS

Round Table Conference¹

PRE-OPERATIVE PRECAUTIONS IN THE PREVENTION OF POSTOPERATIVE PULMONARY COMPLICATIONS

EMILE HOLMAN, M D , F A C S , San Francisco, California

NINETEENTH century surgeons labored courageously but under great handicaps in operating with poorly administered anesthetics, with questionable asepsis, with inadequate tools, and more often in the home than in the hospital. Extraordinary improvements in these phases of operations have occurred, but hazards still remain that threaten the patient and embarrass the surgeon. An operation is an ordeal, a battle of opposing forces, for which the surgeon and the patient should mobilize all possible aids for prompt healing. Occasionally, familiarity with certain standardized surgical procedures breeds a casual carelessness in the surgeon's attitude that invites trouble. He fails to marshal all his forces, caution is momentarily disregarded, details are neglected, or important responsibilities are unwisely delegated to others, and disaster follows. The surgeon must ever be on the alert to use every precaution and every improvement known to surgical science to insure an uncomplicated convalescence.

An important field demanding improved care and an altered surgical attitude is the pre-operative

From the Department of Surgery, Stanford University Medical School

¹Clinical Congress of the American College of Surgeons, New York, N.Y., October 21, 1938

preparation of the patient. A real beginning has been made in the better preparation of the thyrotoxic, anemic, or obstructed patient. The greatly improved results in the surgical treatment of carcinoma of the bowel and rectum are in great measure due to the surgeon's willingness to spend a week or even two weeks in pre-operative preparation. Despite this recognition of its importance, many surgeons have no hesitancy in admitting patients for operation the following day, and are then disappointed when an infection or disruption of the wound, a fatal embolus, or a serious if not fatal pneumonia occurs.

The perfected care of a patient divides itself naturally into three phases: the pre-operative period, the operation itself, and the postoperative period. Just as the operation itself determines the postoperative course, so, I believe, the pre-operative preparation determines the length of convalescence. A few days spent in pre-operative care should decrease, in the long run, the number of days that the patient will spend in the hospital after operation. To admit a patient today and to operate upon him tomorrow is accepting avoidable risks that should and must be eliminated. This is true particularly when dealing with patients from the submerged

half of the population who have been living on overcooked stews doughnuts and coffee or when the patient has been following a grossly inadequate reducing diet. As Minot (14) points out

The major problems of nutrition do not concern clean cut deficiency diseases but the prevention of partial deficiency. Borderline states of nutritional instability are much more common than is usually appreciated. There is a wide zone between optimal nutrition and the level at which classic symptoms of recognized dietary deficient states develop. The undernourished or malnourished patient with a low proteinemia or the patient in whom the vitamin store has been depleted either by disease or by a diet lacking in essential vitamins is an example of a patient in a poor state of nutrition for the ordeal of operation.

Evidence of the importance of nutrition is available from the experimental laboratory. Ravdin (17) and his coworkers have demonstrated a high incidence of disruption of wounds in the presence of a low protein content of the blood. Observations by Lanman and Ingalls (10) confirmed by Taffel and Harvey (16) showed convincingly that in guinea pigs partially depleted of ascorbic acid the healing of operative wounds both histologically and physiologically was inferior to that of a group of control animals. The abdominal wounds of the scorbutic group ruptured at a pressure averaging approximately one third that required to rupture the wounds of normal animals. Previous observations by Hoyer (8) and by Wolbach (19) had indicated conclusively that ascorbic acid is intimately concerned with the synthesis and maintenance of the intercellular supporting materials the all important collagen fibers that provide the framework of healing.

Not only are the vitamins essential in normal healing but evidence is accumulating that they play an important rôle in the prevention and treatment of infection. Green and Mellanby (4) observed that a large number of their dogs receiving defective diets died of bronchopneumonia. Young rats fed on a diet low in Vitamin A died in from six to fifteen weeks with one or more abscesses. In two groups of animals one reared on an inadequate Vitamin A intake the other on an adequate ration of Vitamin A the incidence of infection was 75 per cent in the first group and only 25 per cent in the second group. In another group of 93 animals deficient in Vitamin A 91 showed some evidence of infection.

The outstanding pathological changes due to Vitamin A deficiency concern mainly the epithelial structures and may be epitomized as an

atrophy of the epithelium a reparative proliferation of the basal cells and a substitution of stratified keratinizing epithelium for the normal columnar epithelium. In the lungs of human infants as well as of experimental animals this process leads to occlusion of the bronchi the formation and filling of bronchiectatic cavities with keratinized cells and a resulting atelectasis. In the words of Wolbach (20) The early effect of the deficiency on the respiratory mucosa is a satisfactory explanation of the frequency severity and persistence of the pneumonias that have been in most instances responsible for death in Vitamin A deficient infants.

The significance of the vitamins in relation to infection is further manifested by their increased consumption in the course of an illness. Abassy Harris and Ellman (1) state that pulmonary tuberculosis provides the most extreme example of the increased consumption of Vitamin C. The daily excretion for a standardized diet falls to about one third the controls and the response to three days testing dose is negligible. Martin and Heise (13) demonstrated the existence of a hypovitaminosis due to a lack of Vitamin C in a large majority of tuberculous patients and the degree of hypovitaminosis was found to parallel the extent and activity of the tuberculous process. Greene Steiner and Kramer (5) showed that generalized tuberculosis developed more rapidly in animals chronically deficient in Vitamin C than in non scorbutic animals and that chronic Vitamin C deficiency combined with a tuberculous infection causes a significant shortening of the survival period. Leichtenritt (11) gave large amounts of orange juice to tuberculous guinea pigs on normal diets and found the survival period to be twice as long as that of tuberculous animals on a normal diet alone.

Similarly Harde Rothstein and Ratish (6) found a very low rate of excretion of Vitamin C in pneumonia which indicated an increased consumption of this vitamin in this disease. Vogl (19) applies this knowledge in his treatment of pneumonias by large doses of Vitamin C. As soon as pneumonia is diagnosed the patient receives 200 mgm of ascorbic acid subcutaneously followed by daily doses of from 200 to 500 mgm depending on the severity of the disease. Pulmonary abscess chronic pneumonia or carmification never occurred in cases treated in this manner.

In a study of 17 active cases of osteomyelitis (17 half healed cases 16 healed and 10 controls) Abassy Harris and Hill (2) found a diminished rate of excretion of Vitamin C in the urine and a lowered response to test doses of Vitamin C.

indicative of an apparently increased usage of this vitamin during the infective process, greatest in the active cases, intermediate in the half-healed, and normal in the healed Yavorsky, Almaden, and King (22) examined human tissues at autopsy for their Vitamin-C content, and noted that generalized infections were more common in those with a low Vitamin-C content Woringer and Sala (21) reported scurvy in infants following diphtheria and pertussis

These observations are most important in the conduct and care of any patient who will be subject to the many hazards of infection following any operation As Lauber well said in relation to the hazards of ordinary life "The main value of vitamins lies in prophylaxis, for only that organism which possesses an adequate amount of the vitamins is capable of defence and regeneration"

As to the mode of action of the vitamins in preventing and controlling infection, I believe it can be stated without hesitation that they are not specific in their action One mode of action, presumably, is related to the justifiable assumption that the vitamins are necessary, in adequate amounts, for the proper functioning of the endocrine glands, and that when the latter are producing their proper secretions in sufficient amounts, the entire organism is better equipped to prevent infection and to promote healing

As an example, we might cite the work of Scott (15) who showed that partially adrenalectomized animals withstood toxins and infection much less readily than the controls Furthermore, it has been shown that the adrenal body and the pituitary body contain Vitamin C in more concentrated form than any known substance The inference that these important endocrine bodies need an adequate supply of Vitamin C to function properly is logical Interesting observations by Harris, Passmore, and Pagel (7) give credence to this view They found that guinea pigs suffering from an acute infection with *pasteurella pseudotuberculosis* showed a considerable diminution in the amount of Vitamin C present in their suprarenal glands as compared with controls which had received the same amount of Vitamin C The Vitamin C in the liver, on the other hand, was not significantly affected

Another mode of action may be related to an observation by Manville and Grondahl (12) who found that the regeneration of red cells is possible only if yeast or some factor in yeast is included in the diet Erythrogenesis in rats on a basal diet excluding the Vitamin-B-maturation factor stopped at the megaloblastic stage Some

factor in yeast was necessary to carry the megaloblast to the normoblastic stage The importance of this observation in the restoration of the normal blood volume in the period immediately following severe blood loss at operation cannot be overestimated

These considerations concerning the vitamins have led to certain precautions in the immediate pre-operative period (9) In operations of election, patients are placed on a high vitamin diet at home, or as in the case of the tuberculous patient, in the sanatorium for from one to two weeks before entering the hospital In addition, during this period the important vitamins are prescribed in concentrated form haliver oil, 2 capsules three times a day for Vitamins A and D, brewer's yeast powder, 1 heaping teaspoon in orange juice (or water, or milk, or coffee) three times a day for the various factors in the Vitamin-B complex, and the juice of at least four oranges and two lemons daily for Vitamin C

When a patient is brought into the hospital for diagnosis or observation for a possible operation, the same dietary precautions are emphasized, as well as the ingestion of the concentrated vitamins Operations are delayed whenever possible for at least three days of such preparation, and as soon as solid food is admissible after operation (usually on the third or fourth day), the same concentrated vitamins are administered to be available to the body tissues during the healing and convalescent periods

In a study of the Vitamin-C content of human tissues Yavorsky *et al* (22) found a consistently diminished content in all tissues studied (adrenal, brain, pancreas, liver, spleen, kidney, lung, heart, and thymus) in those patients from forty-six to seventy-seven years of age as compared to the patients from one to forty-six years of age This suggests that the older patients require a longer period of preparation by high vitamin intake than the younger patients

For the emergency operation, little as yet can be done, although in a few instances, the purified Vitamins C and B have been administered hypodermically. It is to be hoped that these purified products, including Vitamins A and D, may soon be available at a reasonable cost for more extensive use in the preparation of patients for emergency procedures It is probable, however, that such purification may eliminate some of the important factors, and dietary administration will remain for some time to come the preparation of choice

A second pre-operative precaution relates to the hazard of exposure, unbeknown to patient or

half of the population who have been living on overcooked stews doughnuts and coffee or when the patient has been following a grossly inadequate reducing diet. As Minot (14) points out:

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Not only are the vitamins essential in normal healing but evidence is accumulating that they play an important rôle in the prevention and treatment of infection. Green and Mellanby (4) observed that a large number of their dogs receiving defective diets died of bronchopneumonia. Young rats fed on a diet low in Vitamin A died in from six to fifteen weeks with one or more abscesses. In two groups of animals one reared on an inadequate Vitamin A intake the other on an adequate ration of Vitamin A the incidence of infection was 75 per cent in the first group and only 25 per cent in the second group. In another group of 93 animals deficient in Vitamin A 91 showed some evidence of infection.

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In a study of 17 active cases of osteomyelitis (17) half healed cases (6) healed and 10 controls. Abassy, Harris and Hill (2) found a diminished rate of excretion of Vitamin C in the urine and a lowered response to test doses of Vitamin C.

thyrotoxic patient, and in the patient who is to undergo extensive gastric or bowel resections, or thoracic operations productive of shock. Subcutaneous infusions are administered as usual during the operation.

The anemic or bleeding patient is prepared with transfusions until the hemoglobin has risen preferably to 60 per cent, but one must occasionally be content with a hemoglobin of 40 per cent. Liver, iron, and concentrated vitamins, particularly Vitamin B, are stressed in the pre-operative diet of the anemic patient.

In the presence of pyloric or intestinal obstruction, or vomiting just preceding operation, a Levine stomach tube is passed through the nose, the stomach washed with saline solution, and the tube left in place to permit ready escape of the gastric contents during operation. Such patients are also operated upon in a moderate Trendelenburg position.

Summarizing, we may say that the following pre-operative precautions are indicated to prevent postoperative pulmonary complications.

1) A high vitamin diet reinforced with vitamin concentrates for from five to ten days before operation. The giving of Vitamins C and B hypodermically before emergency procedures.

2) A high vitamin diet reinforced with vitamin concentrates as soon as feeding after operation permits.

3) Admission to the hospital at least three days before any operation to prevent exposure (unknown to patient or surgeon) to cold contagion in the twenty-four hours before operation.

4) Avoidance of overmedication with the barbiturates and morphine derivatives, all of which are respiratory depressants.

5) In patients with chronic productive bronchitis, bronchiectasis, or intrapulmonary cavitation, the pulmonary tree should be emptied as completely as possible just before anesthesia.

6) Such patients should be operated upon in a moderate Trendelenburg position to avoid any accumulation of pus in the dependent portion of the lung during the operation.

7) In the presence of pyloric or intestinal obstruction, or repeated pre-operative vomiting, a small Levine tube should be passed, a gastric lavage performed with saline solution, and the tube left in place during the operation. The patients should be operated upon in a moderate Trendelenburg position.

8) To counteract the starvation and deprivation of water in the twelve hours preceding the operation, an intravenous infusion of 1,000 c cm of 10 per cent glucose solution is administered beginning two hours before the operation.

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surgeon, to the contagion of the common cold in the forty eight or twenty four hours preceding the operation. It is my belief that not infrequently patients are unwittingly exposed to such contagion immediately before entering the hospital. Signs and symptoms are not sufficient to show the early effects of such exposure and the operation is performed the day following admission. The cold meanwhile is developing and on the day following the operation gives the first evidence of its presence, at the moment of greatest weakness and susceptibility to further extension. To avoid the possibility of such a complication one should attempt to have the patient enter the hospital at least three days before operation to permit observation under hospital care and to prevent contact with contagion carriers. It has been our practice to postpone all operative procedures in the presence of coryza, sinusitis, laryngitis or acute bronchitis and as emphasized by Balfour and Gray (3) operation is delayed at least a week and frequently two weeks after the apparent recovery from an acute respiratory infection.

A third pre-operative precaution against the development of a postoperative pulmonary complication is the avoidance of too heavy sedation with the various morphine and barbiturate derivatives. The tendency these days is to attempt to put the patient almost to sleep before the administration of the general anesthetic by generous doses of nembutal or amyltal reinforced with large doses of morphine and on occasion scopolamine. Extreme care is necessary in the dosage of such combinations particularly since they are all respiratory depressants. As an example of overdosage an instructive case may be cited: a prominent professor of surgery prescribed the following pre-operative medication for a gastrectomy in a patient sixty one years of age: pentobarbital gr 134 at 8:45 p.m., codeine sulfate gr 1 at 2 a.m. for pain, pentobarbital gr 3 at 6 a.m., morphine gr 1/4, scopolamine gr 1/100 at 7:15 a.m. and cyclopropane was begun at 8:05 a.m. As a result this aged enfeebled woman was sound asleep and had an almost complete respiratory inhibition when the general anesthetic was begun which increased immeasurably the difficulty of the administration of the gas anesthesia. On the introduction of an airway the pulse dropped immediately from 104 to 68 which indicated an anoxemia incident to overmedication.

At the Stanford Clinic it is deemed safer to give the barbiturates the night preceding the operation and none the morning of operation

and to give a safe dose of morphine and on occasion scopolamine. Atropine is never to be given with scopolamine and when given with morphine it should be given in small doses. Thick sticky secretions are much more difficult to bring up and as a consequence atelectasis is much more imminent. Nothing should interfere with the proper evacuation of the secretions during the anesthesia.

With regard to morphine and scopolamine it is well to remember that these drugs produce their maximum effect approximately in one to one and one half hours after administration. Ideally this maximum benefit should occur at the beginning of the general anesthesia in order that it may be gradually eliminated in the course of the administration of the volatile anesthetic. In prescribing divided doses of morphine and scopolamine it is unwise to give the second dose before the effect of the first has been determined. When divided doses are administered in the Stanford Clinic the pre-operative medication is ordered by the anesthetist who sees the patient one hour after the administration of the first dose. If the patient is drowsy no further medication is given. If he is alert the second dose is administered.

In patients with chronic productive bronchitis or with productive pulmonary tuberculosis over medication is particularly harmful and should be carefully avoided. Furthermore such patients are required with the help of postural drainage to expectorate their bronchial accumulations just before going under general anesthesia. Every effort is made to rid the bronchial tree of mucus and pus and if it is at all abundant the patient is operated upon in the Trendelenburg position with the head below the level of the thorax to avoid the accumulation of bronchial secretions in the lung.

In all major operative procedures requiring general anesthesia fluids by mouth and food are necessarily withheld during the night preceding operation for approximately twelve hours. A liver depleted of glycogen is notoriously susceptible to the injurious effects of chloroform. In lesser degree it is probably susceptible to all anesthetics. Accordingly to counteract this period of starvation and deprivation of water two precautions are taken: at nine o'clock on the night preceding operation 8 oz. of a high caloric fruit juice or 8 oz. of egg nog are administered then beginning two hours before the hour set for the operation 1000 c.c.m. of 10 per cent glucose solution are slowly administered intravenously. These precautions are particularly helpful in the

ence If the surgeon is rough, if he jams retractors against thin-walled veins, if he clamps vessels and does not ligate proximal to the part of the vessel that has been damaged, thrombosis is encouraged and desiccation hastens this process Thus the technical performance of the operator relates directly to the later complications The surgeon should be gentle, he should keep all exposed tissues moist, he must securely ligate vessels proximal to his clamp, and take care lest tissue juices enter open-mouthed veins He should try to ligate tributary veins close to the major trunk with which they connect in order to avoid a stagnant pool of blood As part and parcel of this meticulous technique he should take care not to strangulate large pieces of tissue, his suture material should be small, and every attempt should be made to have the wound free of debris and necrotic tissue Bacteria enter every wound, but if there be a minimum of foreign material and no dead or dying tissue in the wound, the natural processes of the body will be sufficient to heal the wound without the appearance of sepsis On the contrary, if such careful technique is not carried out, the wound will break down, simple thrombi will become infected thrombi, and these infected thrombi will easily become loosened and depart from the wound to lodge in the lung and produce a pulmonary complication The type of complication in turn will depend on the size of the clot, whether it is infected, what part of the lung it lodges in, how much immunity the patient has for the type of bacteria in the clot, and also on the adequacy of the circulation Because of the liberal anastomotic connections in the lung, an *infarct* is unlikely to be produced from the lodgment of a small embolus However, if the circulation is inadequate, this does not hold true *Abscess* is produced by the septic clot when there is a relatively high immunity to the organism in the clot, encouraging the formation of a walling-off process If the immunity is low, the infection spreads and an area of *pneumonitis* (similar to *bronchopneumonia*) is produced If the clot is large enough, fatal *pulmonary embolism* results

The postoperative efforts in the face of embolic complications are obviously somewhat futile However, an understanding of the mechanism by which the disorders have arisen gives us certain indications

- 1 The circulation must be made as adequate as possible It is better to digitalize individuals before rather than after the procedure, but rapid digitalization can be effected and is often of great assistance Early motion plays a similar rôle and, though I have had no personal experience with its use and prefer digitalization, the institution of thyroid therapy has been shown to be beneficial through the same mechanism, i e., speeding up the circulation

- 2 The *adequate care of sepsis* is important It will serve to prevent the further release of thrombi as tissues break down

- 3 The adequate care of oral sepsis may be important It has been shown that the agents which play a major rôle in the break-down of pulmonary tissue and the production of abscess of the lung are largely the anaerobes of the mouth, chiefly the fusiform bacteria and the spirochetes These organisms are easily injured by arsenicals In patients with "dirty" oral cavities, proved by smear preparations to contain the above organisms, it is often wise to institute intravenous arsphenamine therapy when local areas of pulmonary consolidation occur This therapy will be efficacious only when the lesion is early and the organisms lie in tissue reached by the blood stream If the organisms lie free in an already established abscess, the arsenical preparation obviously cannot reach them and no good results

From this discussion it is obvious that in our opinion embolic lesions are due to what happens in the wounds of our patients A decrease of the incidence of the embolic lesions will come only through an appreciation of the causes of thrombosis and embolism Therapy after the occurrence of embolic lesions should be aimed at (1) restoration of an adequate circulation, (2) the adequate care of wound infection, and (3) the treatment of oral sepsis with arsenical drugs

THE OPERATIVE EFFORTS TO BE DIRECTED TOWARD THE PREVENTION OF PULMONARY COMPLICATIONS THROUGH THE EMBOLIC ROUTE

ELLIOTT C. CUTLER M.D. F.A.C.S. Boston, Massachusetts

PREVIOUS to the introduction of infiltration anesthesia all postoperative pulmonary complications were thought to be due to the aspiration of and the irritation which accompanied inhalation anesthesia. When similar complications followed the use of cocaine (Gottstein 1899 Mikulicz and Kausch, 1900 Gerulanos 1900 Henle 1901) a different conception of the mechanism giving rise to such complications was necessary and embolism from the field of operation was proposed. The differing opinion is still reflected in contributions to this important subject.

At the very base of this problem lies the primitive psychological reaction that the surgeon himself does not like to carry the blame for unfortunate sequelae and naturally seeks an explanation other than of his own creation. It is easy and natural to uphold that an irritative substance which was inhaled should cause pulmonary difficulties. This reason completely disappears however when identical postoperative pulmonary disorders arise following the use of local anesthesia. In the face of this fact it is more remarkable that even our medical colleagues and even the anesthetists who are thus given some escape from criticism should continue to place the major blame on irritation and aspiration.

The fact remains that all of the types of postoperative pulmonary complications have occurred after local infiltration anesthesia. They occur in about the same percentages as after inhalation anesthesia. Major fatal pulmonary embolism has long been accepted though frequently it is set aside as different from the other pulmonary complications. Pulmonary consolidation (pneumonia) pleurisy abscess and empyema have been thought by many to arise by way of differing mechanisms. Why? The patient was well before the surgical procedure after the ordeal there is a serious complication why suppose any other fac-

tors than those so obviously in the surgeon's wound are the source of this difficulty?

It is accepted that the mobility of the part (epigastric incisions carry the highest morbidity) the presence of sepsis and the roughness of the surgeon contribute to the occurrence of these complications. We have repeatedly made studies in this field and have pointed out that embolism may be the mechanism resulting in the occurrence of such sequelae. We have been able to substantiate this point of view experimentally. By liberating clots in the jugular vein of dogs we have shown that all of these pulmonary complications may be produced the type of complication depending upon the size of the clot whether it was infected or not and if it was infected how great an immunity the animal had established to the infecting organism. Thus a grossly infected clot in an animal with no immunity produces a rapidly spreading pneumonitis a fragment of the same clot of the same size in a thoroughly immunized animal produces a temporary infarct which may give the clinical signs of pleurisy if it reaches the periphery of the lung and a fragment of the same clot of the same size in a partially immunized animal will produce a local lesion which will break down and result in an abscess. With this experience behind us it is natural that we should believe that the prevention of such complications lies in better treatment of the tissues in the wound by the surgeon.

We have repeatedly studied the percentage of complications in relation to the type of surgery and have convinced ourselves that the surgeon who was rough who allowed desiccation of the tissues in the wound and who took little care of hemostasis experienced a higher percentage of complications than his more gentle colleague who practiced a more meticulous technique. Let us consider for a moment the factors giving rise to thrombosis these are slowing of the circulation time and the presence of bacteria and injury to the intima. The speed of the circulation depends upon the cardiac effectiveness and may be improved by adequate pre-operative medications. The presence of bacteria unless new infections be introduced is beyond our control but the injury to the intima is something the surgeon can influ-

Model of Professor of Surgery Harvard Medical School
W. K. Anrep introduced cocaine as an anesthetic in 1890 Carl
Kell' r of and first used it as a surgical anesthetic in 1890
et alio in 1894 and J. L. Corn introduced it as an anesthetic in
1895 Reclus in 1895 described it as a local anesthetic in
field and C. H. G. papers in 1895 and 1900 and with first
to recommend this method of anesthesia generally to surgeons

TRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Bogart, D W Certain Postoperative Complications of Cataract Operations
Reference to a Study of 1,004
Am J Surg, 1938, 42 39

Following cataract operations are performed because they may result in paralysis of visual acuity. For the purpose of studying the causes of these complications, the results of intracapsular and extracapsular operations in the hands of the average cataract surgeon were examined. Of 1,004 clinic patients operated upon by cataract surgeons, 70 per cent were operated on by house surgeons, 30 per cent by cataract surgeons.

Of the 1,004 patients operated upon, 17 per cent of the intracapsular operations resulted in complications, 14 per cent of the extracapsular operations resulted in complications. Of the 17 per cent of the intracapsular operations, 14 per cent resulted in complications, and of the 14 per cent of the extracapsular operations, 14 per cent resulted in complications. Other complications occurred in only a few cases in each

category. The patient should be examined to eliminate many of the causes of complications, and should include a history of infection. If foci are found, or the resistance of the patient should be raised. A study of the patient will help prevent mental complications, as well as his sitting up and his getting out of bed. Elderly patients should be examined from the first forty-eight to seventy-two hours. A hole cut in Ring's band. A pre-operative trial of anesthesia due to idiosyncrasy. Several days before the operation conditions, such as diabetes, and syphilis should be controlled. If one eye has been operated, the patient's sensitivity to lens anesthesia had developed. Instillation of 1 per cent silver nitrate to prevent postoperative anesthesia and akinesia should be included in the retrobulbar and adrenalin. A sufficiently

large section of the cornea, care in using the instruments, and the use of half-normal saline solution warmed to body temperature help prevent striate opacity of the cornea. The incision should be made so as to obtain a complete conjunctival flap. Care should be used to avoid dislocation of the lens. Removal of all retained cortex should be assured by the use of the ultraviolet lamp. The wound should be completely closed by sutures as soon as the lens presents, and the lips of the conjunctival wound should be pinched together.

The patient should not be permitted to strain or cough after operation. Strong miotics should be avoided after primary instillation, unless prolapse of the iris occurs. Observation of the upper border of the wound or touching of the upper eyelid should be avoided.

The treatment of postoperative complications is summarized as follows:

Abrasion of the cornea and a tendency of the iris or vitreous to prolapse require a firm dressing. Hot applications and dionine are used for striate keratitis. Delayed wound closure calls for the preparation of a conjunctival flap, iridectomy, excision of vitreous, or clearing of the wound in other ways. Trichloroacetic acid may be applied for cystoid scars or for small beads of prolapsed iris (electrocoagulation has been reported of value). For extensive prolapse of the iris not covered by conjunctiva, a small iridectomy may be performed and the wound closed with sutures. If the prolapse is extreme a flap may be made by dissection upward from the cornea.

Repeated hemorrhages can be controlled by intravenous calcium gluconate, normal horse serum, snake venom, and brain extract given intravenously.

For detachment of the choroid, sedatives, elevation of the head, and measures to increase the coagulating power of the blood are indicated. Detachment of the choroid is thought by some to occur much more frequently than has been estimated. In one case an almost complete detachment was observed, but there remained no trace of the condition ten days after operation.

Detachment of the retina is not necessarily a complication of the operation, but may be caused by anterior choroiditis of tubercular or infectious origin. Myopia and loss of vitreous were important factors in 30 cases reported by Shapland. Woodruff reported cures in only 18 per cent after operation. Cruise reported success with the Safar operation. The Gonin method resulted in complete reattachment in one of the cases seen by the authors, in which the subretinal fluid was aspirated. A final acuity of 20/30 resulted.

THE POSTOPERATIVE EFFORTS TO BE DIRECTED TOWARD THE PREVENTION OF PULMONARY COMPLICATIONS THROUGH THE BRONCHIAL ROUTE

CLAUDE S. BECK, M.D., F.A.C.S., Cleveland, Ohio

MY discussion concerns the period beginning when the surgeon has completed his last suture the anesthesiologist is with the patient and the patient is still on the operating table. If inhalation anesthesia has been used the surgeon can and should expect the patient to be awake or responsive to stimuli when the operation is finished. He can expect the air passages to be free of mucus and secretions. The patient must not be cyanotic and his skin must be warm and dry. These are the requirements of satisfactory inhalation anesthesia today. In the words of Henderson, "It is not many years since it was a matter of course that after every major operation the patient lay long unconscious, hypopneic and therefore cyanotic, then nauseated and tasting the incompletely exhaled anesthetic for hours. In part these conditions were due to acapnia induced by overbreathing and washing out of carbon dioxide under the influence of anesthetic excitement and moderate oxygen deficiency. In part they were due also to the acardia-diminished blood alkali—that asphyxia and acapnia induce. Simultaneously the volume of the circulation was subnormal owing largely to the stagnation of the blood in atonic tissues. All of these features of depression are now largely avoided by the increasing skill of anesthesiologists in preventing both anoxia and acapnia." (10)

Inhalation anesthesia has been almost revolutionized by the judicious use of carbon dioxide. The anesthesiologist knows that carbon dioxide mixed with the anesthetic steadies and deepens respiration. It reduces the danger of respiratory failure and as the operation is being finished it ventilates the anesthetic out of the blood, it improves both the venous and the arterial circulation, it reduces postoperative vomiting and it restores tone to the muscles, especially to the diaphragm and gastro-intestinal tract (11). Mild hyperventilation of the lungs with carbon dioxide at the close of an operation gives the patient a good start on the postoperative course. Recently attention has

been directed to the low proportion of inert gases chiefly nitrogen in the anesthetic mixtures commonly used. It has been pointed out that practically all the gases in the anesthetic bag are readily absorbable through the lung and that collapse of the lung by absorption can take place during the operation. These readily absorbable gases consist of the anesthetic oxygen and carbon dioxide. It has been suggested that the high concentration of oxygen in the anesthetic bag can produce so-called oxygen poisoning and collapse of the lung tissue. Helium and hydrogen are inert gases. It is quite possible that these gases will find a useful place in the dilution of anesthetic mixtures in the future, but it is too early to make a statement concerning their value. (4)

The patient is always entitled to start the postoperative course with the anesthetic well ventilated out of his system. The patient is entitled also to be awake and not nauseated. The patient is entitled to have the respiratory passages free of mucus and secretions. If he cannot rid himself of such secretions they should be removed by suction. If there is any gastric juice or secretion in the tracheobronchial tree his head should be lowered and suction should be carried out through a catheter inserted into each bronchus. In no event should the air passages remain partially obstructed. The patient should not be chilled nor should he be overheated. Dry clothes should be placed on him.

The next consideration is the dressing of the wound. Two requirements are to be met. One concerns satisfactory splinting of the wound and the other concerns absence of interference with the respiratory movements. Obviously the wound must be adequately supported. If it is not satisfactorily supported the patient will refuse to cough up secretions. At the same time an abdominal dressing should not be applied over the lower part of the chest so that tidal exchange is not interrupted. Powers (19) has shown that tight abdominal binders and adhesive strapping play very little part in the reduction of the vital capacity after abdominal surgery, although Churchill and McNeil (6)

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Berens, C., and Bogart, D. W. Certain Postoperative Complications of Cataract Operations with Especial Reference to a Study of 1,004 Operations *Am J Surg*, 1938, 42 39

Complications following cataract operations are serious principally because they may result in partial or complete loss of visual acuity. For the purpose of studying the causes of these complications, and comparing the results of intracapsular and extracapsular extraction in the hands of the average surgeon, the records of cataract operations performed at the New York Eye and Ear Infirmary during the past two years were examined.

Of the total of 1,004 clinic patients operated upon for cataract by staff or house surgeons, 70 per cent had extracapsular and 30 per cent intracapsular extractions. Seventeen per cent of the extracapsular operations were attempted intracapsular operations.

The most frequent postoperative complications were hemorrhage into the anterior chamber, which occurred in 4 per cent of the intracapsular and 1.4 per cent of the extracapsular extractions, and loss of vitreous, in 9.9 per cent of the intracapsular and 9.0 per cent of the extracapsular extractions. Other complications occurred in only a few cases in each series.

Preliminary examination of the patient should be complete, which will eliminate many of the causes of postoperative complications, and should include a careful search for foci of infection. If foci are found they should be removed, or the resistance of the patient to them should be raised. A study of the psychology of the patient will help prevent mental disturbances after operation, as well as his sitting up in bed the same day and his getting out of bed the day after operation. Elderly patients should be watched carefully from the first forty-eight to seventy-two hours, and should have a hole cut in Ring's mask at the first dressing. A pre-operative trial of sedatives prevents disturbance due to idiosyncrasy. Mild sedation for several days before the operation is of value. General conditions, such as diabetes, high blood pressure, and syphilis should be controlled before operation. If one eye has been operated upon previously the patient's sensitivity to lens antigen and uveal pigment should be studied, especially if postoperative inflammation had developed.

The pre-operative instillation of 1 per cent silver nitrate and argyrol helps to prevent postoperative infections. Adequate anesthesia and akinesia should be used, and these should include the retrobulbar injection of procaine and adrenalin. A sufficiently

large section of the cornea, care in using the instruments, and the use of half-normal saline solution warmed to body temperature help prevent striae opacity of the cornea. The incision should be made so as to obtain a complete conjunctival flap. Care should be used to avoid dislocation of the lens. Removal of all retained cortex should be assured by the use of the ultraviolet lamp. The wound should be completely closed by sutures as soon as the lens presents, and the lips of the conjunctival wound should be pinched together.

The patient should not be permitted to strain or cough after operation. Strong miotics should be avoided after primary instillation, unless prolapse of the iris occurs. Observation of the upper border of the wound or touching of the upper eyelid should be avoided.

The treatment of postoperative complications is summarized as follows:

Abrasion of the cornea and a tendency of the iris or vitreous to prolapse require a firm dressing. Hot applications and dionine are used for striae keratitis. Delayed wound closure calls for the preparation of a conjunctival flap, iridectomy, excision of vitreous, or clearing of the wound in other ways. Trichloroacetic acid may be applied for cystoid scars or for small beads of prolapsed iris (electrocoagulation has been reported of value). For extensive prolapse of the iris not covered by conjunctiva, a small iridectomy may be performed and the wound closed with sutures. If the prolapse is extreme a flap may be made by dissection upward from the cornea.

Repeated hemorrhages can be controlled by intravenous calcium gluconate, normal horse serum, snake venom, and brain extract given intravenously.

For detachment of the choroid, sedatives, elevation of the head, and measures to increase the coagulating power of the blood are indicated. Detachment of the choroid is thought by some to occur much more frequently than has been estimated. In one case an almost complete detachment was observed, but there remained no trace of the condition ten days after operation.

Detachment of the retina is not necessarily a complication of the operation, but may be caused by anterior choroiditis of tubercular or infectious origin. Myopia and loss of vitreous were important factors in 30 cases reported by Shapland. Woodruff reported cures in only 18 per cent after operation. Cruise reported success with the Safar operation. The Gonin method resulted in complete reattachment in one of the cases seen by the authors, in which the subretinal fluid was aspirated. A final acuity of 20/30 resulted.

Overholt Powers Shatzky Synder Tondeur of France Turnbull of New Zealand Waldron and Watter

Hyperventilation of the lungs is of no value in the reduction of the incidence of postoperative pulmonary complications according to Beecher Bogan Bruscoe Dowling King Mason Reimann, Ryan and Sise. The problem has been studied from the standpoint of pulmonary physiology. It has been shown that definite alterations take place after laparotomy. According to Beecher (2), these alterations are severe and consist of a marked reduction of the tidal air, an increase in the respiration rate, a rapid shallow type of respiration, a marked reduction of complementary air and also of supplemental air, a crippling of both forced inspiration and expiration, a marked reduction of the vital capacity and a marked decrease of the subtidal lung volume and the maximum lung volume. According to Beecher's study, these alterations in pulmonary physiology after laparotomy were the same whether hyperventilation with carbon dioxide inhalation was used or not. On the other hand, Powers (19) has shown that the reduction of the vital capacity is less severe after operation when hyperventilation is used.

Having reviewed the literature on the subject it is my conclusion that hyperventilation of the lungs by the use of carbon-dioxide inhalation after operation should be continued as a routine measure. This conclusion is soundly conceived if one accepts pulmonary hypoventilation as the fundamental mechanism in the production of

these complications. Hyperventilation also assists in clearing the air passages by making the patient cough. At the same time we must conclude that its value as a prophylactic measure has not been established definitely on a statistical basis.

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CLOSING REMARKS BY DR HOLMAN

In addition to the points already covered I should like to stress the great importance in the postoperative period of frequent change of position immediately after the return of the patient to his bed. It is routine on my service to order a 90 degree change of position every hour for the first three days following which the patient is instructed to move freely about in bed at least every hour and to flex and extend his knees and thighs at very frequent intervals. Such activity undoubtedly increases the rate of circulation, prevents the stagnation of blood in restricted areas and improves the respiratory exchange by the prevention of stagnation and accumulation of

secretions in limited areas of the bronchial tree. Moreover, such changes of position are the best guarantee against the accumulation of fluid and gas in restricted portions of the gastro-intestinal tract and thus prevent acute dilatation of the stomach and intestinal distention.

In addition immediately after operation the patient is made to take six or eight deep breaths every half hour, an exercise that we believe does as much good as the carbon dioxide inhalations except under very special conditions.

I wish to express my sincere thanks to Drs Cutler and Beck for their instructive contributions to this discussion.

19 inhabitants left their community (11 boys and 8 girls) to pursue their studies in higher schools in other localities. They ordinarily left at about the age of eleven years and returned to the community from nine to eleven years later. When examined upon their return no goiter was found except in 2 girls, in whom the goiter was very small, these girls had been absent from the villages approximately from four to six years.

Superficial water was found to induce thyroid disturbances, and when water was taken from a greater depth in the same localities it did not have these properties. Although iodine deficiency cannot be considered a determining factor, there is nevertheless a predisposition to goiter when such a deficiency exists.

Females are more frequently afflicted with endemic thyroidism than males, pregnancy aggravates the condition. Endemic thyroidism may be congenital, but usually commences early in life, developing most commonly at puberty.

Without doubt heredity plays a rôle in endemic thyroidism and definitely favors cretinism. Histories of a very large number of families with thyroid disturbances in endemic regions show that individuals living under the same conditions, nourished in the same manner, and exposed to the same determining factors may develop either the simple goiter, the hyperthyroid, or the hypothyroid type.

Sporadic thyroidism is rarely found in families with thyroid affections and is due to variable causes such as intoxications, infections, and nervous factors. The factors responsible for sporadic thyroidism have most commonly been typhoid fever, pneumonia, and postpuerperal infections. Basedow's disease has been found to develop following emotional stress. Iodine deficiency provokes a hyperplastic thyroidism.

The factor which produces thyroid disturbances acts also upon the anterior lobe of the hypophysis. Thyroidism which is caused by a nervous factor is produced by the action of the nerve centers on the hypophysis with the resultant hyperproduction of hypophyseal thyreostimulant.

RICHARD J. BENNETT, JR., M.D.

Curtis, G. M., and Puppel, I. D. The Iodine Metabolism in Exophthalmic Goiter. *Ann Surg*, 1938, 108: 574.

The blood iodine in untreated exophthalmic goiter is usually increased. Curtis found an average of 26 micrograms per cent in the blood of 11 patients with exophthalmic goiter, as compared to an average normal of 12, but there was no direct correlation between the level of the basal metabolic rate and the concentration of the blood iodine. Thus, a patient with a basal metabolic rate of +18 per cent had a blood iodine of 30 micrograms, while one with a basal metabolic rate of +95 per cent had a blood iodine of 13 micrograms per cent. By the use of a new technique, the normal blood level was found to be only 4 micrograms per cent. The iodine in the

urine, feces, and sweat was determined in 10 patients, 5 of whom had an elevated basal metabolic rate. All 10 had a negative iodine balance, those with hyperthyroidism losing about four times the amount ingested. This negative iodine balance is compared to the negative calcium balance in hyperparathyroidism.

PAUL STARR, M.D.

Naffziger, H. C. Progressive Exophthalmos Associated with Disorders of the Thyroid Gland. *Ann Surg*, 1938, 108: 529.

Clinical records indicate that exophthalmos occurs in 50 per cent of patients who have exophthalmic goiter, although the clinical evaluation of the degree of the exophthalmos is almost useless. In one-half of the cases the exophthalmos disappears after operation, in another 20 per cent, it decreases in a few patients there is progression of the condition in varying degree, but in only a very small number does it progress to a dangerous degree.

Operations on the sympathetic nerves result in a variance in the size of the lid fissure and pupils, but the position of the globe in the orbit remains unchanged.

The author's operation was performed in the cases of 31 patients, including 8 personal cases. The results were unsatisfactory in 4 patients and there were 2 deaths.

In the author's series of 8 cases, the ages of the patients (4 women and 4 men) ranged from twenty-eight to fifty-three years. All of the patients had operations for typical exophthalmic goiter. Progression of the exophthalmos was noticed within two months following the operation, the basal metabolic rate varied from normal to minus 32, the eyelids became puffy, the conjunctiva edematous, and the eye movements limited. Corneal ulceration appeared later. Vision varied according to the condition of the cornea and the optic nerve. Retrobulbar resistance was definite. Immediately after operation, improvement was noted.

In every case, the orbit was tightly packed with extrabulbar muscles, and the volume was five to ten times that of normal. The color was pale, and microscopic examination showed the presence of a Zenker-like degeneration. There was a fraying of the muscle fiber which stained for collagen. Interstitial edema was definite. Round-cell infiltration was present, particularly perivascularly, apparently in response to the muscle necrosis. Biopsies from other muscles failed to show such changes, although they have been reported in the literature.

Some cases which show no evidence of thyrotoxicosis may show exophthalmos due to a myopathy, rather than a demonstrable neurological disorder. Naffziger was able to produce proptosis by the injection of the thyrotropic hormone of the pituitary gland. Marine and Rosen believe that exophthalmos is produced by this hormone and that its development is inhibited, at least partially, by gonadectomy and prevented by thyroxine.

FRED S. MODERN, M.D.

Hypertension caused by indocyclitis may respond to aspiration of the anterior chamber or paracentesis and mydratics. For persistent hypertension irido corneosclerectomy after simple extraction may be done. If an iridectomy has been performed corneosclerectomy over one pillar may be combined with iridocyclitis.

Postoperative non suppurative inflammation requires search for and treatment of chronic infections.

Ititis caused by retained protein in the anterior chamber requires atropine infra red rays auto hemic injections and typhoid vaccines or other foreign proteins. Endophthalmitis phaco allergica requires desensitization to lens allergen before and after operation. Injections of uveal pigment should be used if sensitiveness develops coincidently with postoperative inflammation.

Smears and cultures indicate the treatment of choice in suppurative infections. Pneumococcus serum should be used if indicated. Other measures are irrigation of the anterior chamber with 1:4000 hexylresorcinol solution intravenous typhoid vaccine or typhoid H antigen.

When expulsive hemorrhage occurs sedatives sutures scleral puncture and lightly compressing dressings are necessary.

Aside from the necessary careful technique at operation one of the most important factors in avoiding complications is the use of care in making postoperative dressings especially the avoidance of pressure by unnecessary or clumsy manipulation.

It is possible to avoid entirely or to render comparatively harmless many of the complications which often result in a greater or lesser degree of blindness.

The number of immediate and postoperative complications was approximately the same in both the extracapsular and the intracapsular groups which indicated that as done at this institution the intracapsular operation is a valuable and fairly safe procedure in the hands of the average surgeon.

EDWARD S. FLATT, M.D.

NOSE AND SINUSES

Semenov H. The Surgical Pathology of Nasal Sinusitis. *J Am Med Ass* 1938 111: 2189.

The author states that the microscopic changes of the sinus mucoperiosteum in several hundred surgical specimens showed that thickening in excess of 2 mm. was associated with deep seated degenerative changes in 50 per cent of the cases.

Purulent sinusitis constituted 73 per cent of the cases and non purulent hyperplastic polypoid and cystic degeneration constituted 28 per cent.

Degeneration of the mucous membrane of the sinuses may be explained in part by the rudimentary microscopic structure of the stroma. A preponderance of loose areolar tissue favors the formation of mesothelial cysts and polypoid degeneration. Membranes of the sinuses endowed with a more fibrous periosteal type of stroma are resistant to the

same pathological processes. The healing power in such a membrane is shown in the case described as it appeared after twenty five years of mucopurulent sinusitis.

Manifest allergic sinusitis occurred in 17 per cent. Non allergic inflammation of the sinuses as determined by a careful history and examination of the patient and histological preparations appeared in 47.6 per cent of the cases.

The allergic membrane is prone to infection and resistant to treatment. The degenerative changes were greater in the allergic sinuses. Hyperplastic sinusitis especially the bilateral type was allergic in 70 per cent of the non purulent cases.

Ti sue cultures revealed a preponderance of streptococci and staphylococci in chronic sinusitis mixed infection being present in 80 per cent.

Exudative sinusitis usually responds to conservative treatment. Degenerative changes which are irreversible in character require treatment of a radical type.

Postoperative healing in the paranasal cavities is accomplished by the formation of a dense layer of white fibrous connective tissue which epithelizes by an ingrowth of nasal mucosa.

JAMES C. BRASWELL, M.D.

NECK

Danilopolu D. and Others. The Classification and Pathogenesis of Endemic and Sporadic Thyroidism. (*Classification et pathogenèse des thyroïdismes endémiques et sporadiques*). *Presse méd* Par 1938 46: 1363.

For this study 38,657 medical observations were made in Roumania. The authors have separated the normal from the pathological physiology of the thyroid and propose a new classification of these affections believing that the thyroid in addition to its morphogenic and metabolic functions possesses also a vegetative function.

Thyroidism is defined and the physiologicopathological classification of thyroid conditions is as follows: (1) normal thyroidism (2) hyperthyroidism (3) hypothyroidism and (4) parathyroid affections.

The geographical distribution of thyroid disease showed that in the villages where the economic situation was very bad endemic thyroidism was found. In the towns of the same region where the economic situation was much better the endemic thyroidism was less pronounced. The authors know of a region in which for forty years endemic thyroidism was very common and in which this condition has diminished following the institution of methods of communication and the establishment of the petroleum industry which has raised the standard of living.

One must live many months in a region before endemic thyroidism will develop. The inhabitants who left the region for several years found that their goiter diminished or even disappeared. In one region

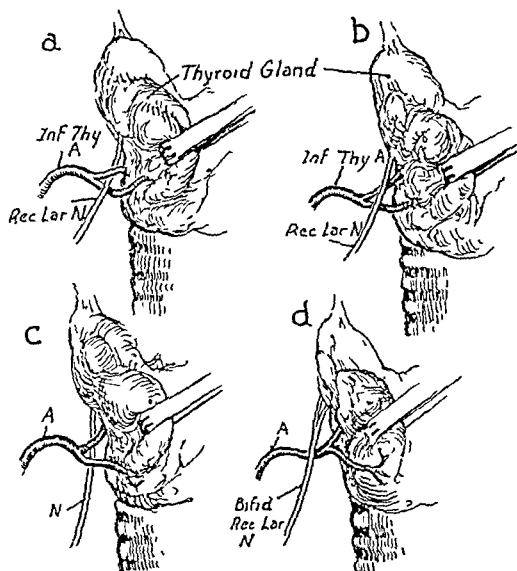


Fig 1 Variations in the relationship between the recurrent laryngeal nerve and the inferior thyroid artery encountered in operations on the thyroid (a) An uncommon relationship the nerve passing over one branch of the inferior thyroid artery and under the other (b) Not the rule, but a not uncommon relationship the nerve passing entirely anterior to the artery (c) By far the most common relationship the nerve passing entirely posterior to the artery (d) A not uncommon division of the nerve before entering the larynx (Courtesy of J B Lippincott Co)

behind the thyroid stump. The nerve lies very close to the bleeding point. If, however, the trunk of the inferior thyroid artery is ligated, instead of the point of bleeding, the nerve lies at a sufficient distance to be safe. This is a valuable point.

The severed recurrent laryngeal nerve should be reunited within three months after the injury. During the search for the nerve stumps, the thyroid remnants should be completely isolated from the internal jugular vein and common carotid artery. Then the thyroid remnant is rotated inward and the inferior thyroid artery identified. A Berens' magnifying loupe aids in the identification of the nerve. The upper end can usually be found where the lower horns of the thyroid cartilage are in contact with the cricoid. At present there is no way in which one can be sure of how to unite adductor with adductor, and abductor with abductor fibers. The nerve is a little flat and the sutures should be on the inner and outer margins. If the slack between the nerves is slight, occasionally it can be increased by cutting of the inferior thyroid artery. If a nerve graft has to be done, the technique of Duell and Ballance or a foreign nerve graft is recommended.

A rare abnormality is the non-descent of the recurrent laryngeal nerve, in which instance it may be injured at the upper thyroid pole.

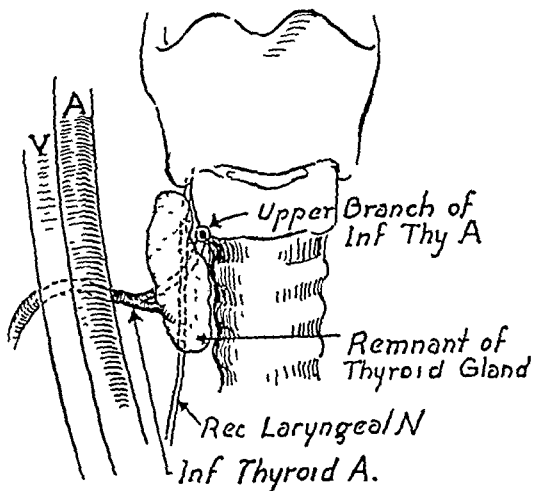


Fig 2 Showing the relationship of the recurrent laryngeal nerve, before it enters the larynx, to the upper branch of the inferior thyroid artery. This is depicted diagrammatically as seen from above as it is in a subtotal thyroidectomy. Attempts to snap this bleeding branch in its position between the thyroid and the trachea can result in injury to the recurrent nerve.

The arrow points to the trunk of the inferior thyroid artery, at which point it should be ligated for bleeding of the upper branch of the inferior thyroid artery, rather than an attempt being made at ligation of the bleeding vessel itself.

Large intrathoracic goiters cause a safe displacement of the nerve and rarely lead to injury.

If both recurrent laryngeal nerves are permanently injured, the patient may have comfort and ability to speak through a tracheotomy tube fitted with a Tucker valve. If he objects to the tube and is content to speak permanently with a hoarse voice, then the submucous resection of the vocal cords may become necessary. This gives ample air space and the operation was successful in 75 per cent of the cases.

FRED S. MODERN, M.D.

Richards, L. Types of Laryngeal Obstruction and Their Treatment. *Am J Surg*, 1938, 42: 239

The author states that the cardinal signs of laryngeal obstruction are an increasing respiratory and pulse rate, stridor, indrawing of the suprasternal, suprasternal, and epigastric spaces, restlessness, and pallor or cyanosis.

Acute inflammatory disease, new growths (benign or malignant), muscular spasm or paralysis, external pressure, and the presence of foreign bodies account for the majority of cases of acute laryngeal obstruction.

Healed inflammatory disease and faulty tracheotomy are the causes of most cases of chronic laryngeal obstruction.

Severe acute laryngeal obstruction demands prompt and adequate relief either by intubation or

Frazier W D and Rardin I S The Use of Vitamin B₁ in the Pre-Operative Preparation of the Hyperthyroid Patient. *Surgery* 1938 4 680

The observation of hyperthyroid patients with satisfactory reduction of the metabolic and pulse rates but who continue to have anorexia and weight loss after iodine therapy and others who have loss of weight out of proportion to the increase in the basal metabolic rate and appetite level suggests that although the caloric intake of these patients may be sufficient absorption or utilization of the ingested foodstuffs may be below the normal.

If the metabolic rate is raised by disease or the administration of thyroxin Vitamin B₁ must be added to the diet to prevent the appearance of the symptoms of a B₁ deficiency which may develop rapidly. As the capacity for storage of this vitamin in human tissues is limited the maintenance of the Vitamin B₁ stores in the tissues is dependent on an adequate intake in the diet.

Although most hyperthyroid patients have increased appetite at the onset of the disease the majority develop anorexia if the thyrotoxic symptoms are maintained. Hinrich Goldfarb and Cowgill have shown that anorexia develops much more rapidly in dogs fed thyroxin and a diet deficient in Vitamin B₁ than in those getting a normal diet plus thyroxin. They suggested that a B₁ deficiency may be the important factor in the anorexia and weight loss of hyperthyroid patients.

Sure and his associates found that by means of a highly concentrated Vitamin B₁ extract they were able to reduce the injurious effect of thyroxin in the rat. Later they were able to protect these animals entirely from the toxic influence of thyroxin by the parenteral administration of very large amounts of crystalline Vitamin B₁. Recently they have reported that Vitamin B₁ is more effective if the other components of the B complex are added. Other authors have demonstrated that the administration of additional carbohydrate to the diet of various animals markedly increases their requirement for the B fraction. If this requirement is not met hyperglycemia and depletion of liver and muscle glycogen result. If Vitamin B₁ is then supplied in adequate amounts the blood sugar falls and glycogen storage in the liver is increased. It is well known that thyrotoxicosis is commonly associated with disturbance of the carbohydrate metabolism. These changes are characterized by hyperglycemia, decreased glucose tolerance and depletion of the liver glycogen. The similarity between these changes and those attributed to B₁ deficiency is noteworthy. It is now generally agreed that the administration of an abundant supply of readily assimilable carbohydrate is an important step in the treatment of severe grades of thyrotoxicosis. If thyrotoxic patients are deficient in Vitamin B₁ it seems equally important that this factor be supplied during the period that the carbohydrate intake is being increased.

To study the importance of the B complex a control group of 28 patients were given a high carbo-

hydrate diet without Vitamin B₁ in addition to the usual therapeutic measures while another group of 50 patients were treated in a similar manner but received hypodermically 10 mgm of crystalline Vitamin B₁ every other day and 10 mgm of Brewer's yeast daily by mouth. There are three reports in which the group given Vitamin B₁ showed improvement over the control series by the degree of reduction of the pulse rate, the number of patients who gained weight and whose appetite increased and the length of time required for adequate pre-operative preparation. The improvement noted in the series treated with the Vitamin was most marked in the more toxic group in whom avitaminosis is most likely to develop. These findings are in agreement with the known effect of Vitamin B₁ on the cardiovascular and gastro-intestinal symptoms of Vitamin B deficiency. HAROLD C OCHSNER M D

Smith M K The Amount of Thyroid Tissue to be Left in Operations for Diffuse Toxic Goiter. *Ann Surg* 1938 108 563

In a series of 75 patients with diffuse toxic goiter the weight of the remnant of thyroid after thyroidectomy was indirectly estimated by weighing a similar piece of the specimen removed. It was thus found that in 65 patients among whom there were no recurrences the remnant had weighed about 7 gm or less and that in 10 patients in whom persistence of the elevated metabolism had occurred postoperatively the remnants averaged 10.4 gm. The author therefore advises that the surgeon leave a remnant weighing 6 gm. This corresponds to a piece measuring 3 by 1 by 1 centimeters on each side.

LAURENCE M D

Lahey F H and Hoover W B Injuries to the Recurrent Laryngeal Nerve in Thyroid Operations. *Ann Surg* 1938 108 345

The recurrent laryngeal nerve was injured in 14 1/2 per cent of Lahey's cases and in 3 per cent of other writers' cases. Lahey exposes routinely the recurrent laryngeal nerve in the course of thyroidectomy and proves that it can be seen and palpated against the trachea and that its moderate stretching causes no paralysis moreover that it can be satisfactorily sutured if severed.

In the usual course of severance of the recurrent laryngeal nerve there is no immediate respiratory difficulty if both nerves are cut but the patient is unable to talk following the operation. In six months the ability to talk improves but dyspnea becomes increasingly severe on even moderate exertion. Inspiratory crowing and roaring during sleep are other symptoms.

The most frequent site of injury is at that point where the nerve becomes intralaryngeal (Fig 2). It is rare at the level of the inferior thyroid artery (Fig 1).

One of the frequent reasons for bleeding is the tearing off of the upper branch of the inferior thyroid artery close to the trachea when it retracts

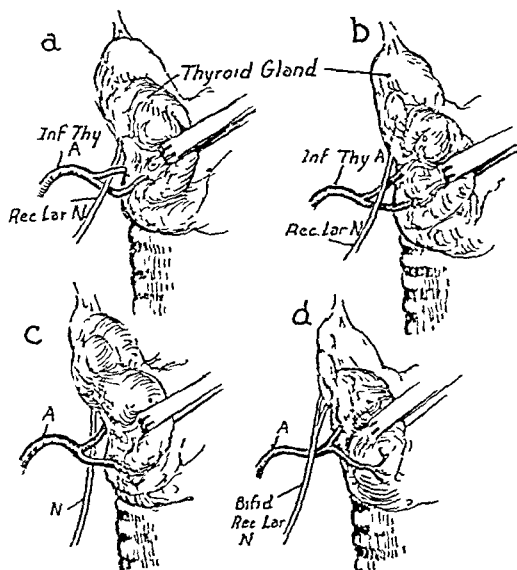


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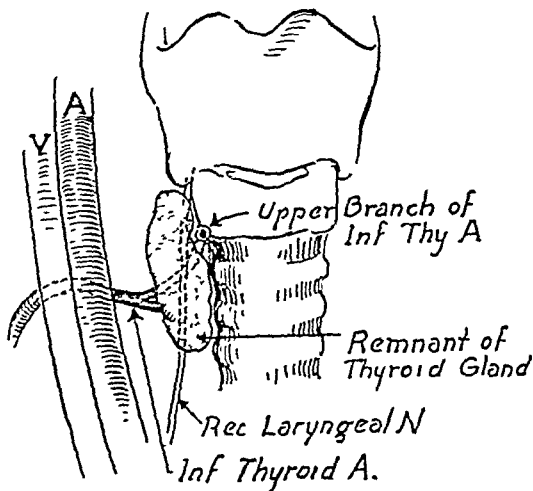


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Healed inflammatory disease and faulty tracheotomy are the causes of most cases of chronic laryngeal obstruction.

Severe acute laryngeal obstruction demands prompt and adequate relief either by intubation or



Fig 1

tracheotomy Chronic stenosis requires either dilatation or plastic reconstruction (Courtesy of Am J Surg)

JAMES C BRASWELL M D

Freedman A O Diseases of the Ventricle of Morgagni With Special Reference to Pyocoele of a Congenital Air Sac of the Ventricle *Arch Oto Laryng* 1938 28 329

Laryngologists regarded the ventricle of the larynx as merely a slit between the true and false vocal cords before this space was more fully described by Morgagni. Hilton made a thorough study of this ventricle noting its anterior upward extension to form the anterior vertical blind pouch which is known as the sacculus ventriculi laryngis. Negus proved conclusively that the function of the larynx is not primarily that of phonation but that of an inlet valve for the purpose of respiration. He traced the development of the larynx phylogenetically and demonstrated modifications which took place in this organ in the various species in order to adapt it to the requirements of each. The sacculus in man is considered the vestigial homologue of the ventricular air sac of the higher apes.

A study of the normal structure of the larynx is important in the study of the origin and location of the various pathological conditions that may occur. Normally the true cord the free margins of the ventricular band and the posterior surface of the epiglottis are covered with stratified squamous epithelium. The rest of the larynx the ventricle of Morgagni and the sacculus are covered with stratified columnar epithelium. The stroma contains lymphoid cells scattered singly and in islands. Many tubular glands lined with mucous and serous cells appear in the submucosa of the ventricle and sacculus and empty their contents into the ventricle. The glands are imbedded in fat surrounded by the thin muscle fasciculi of the thyroepiglotticus and aryepiglotticus muscles. In the region of the true vocal cords there are practically no glands and the entire submucosa consists of muscle.

Because of the abundance of mucous and serous glands surrounding and discharging into the sacculus and ventricle it has been suggested that physiologically the sacculus may be considered the oil can of the vocal cords. Since the ventricle and sacculus are

blind stagnant recesses surrounded by a mucosa which is rich in mucous glands and lymphoid tissue it is probable that cancer tuberculosis and benign papilloma occur more frequently in these areas than has hitherto been supposed. Thus the laryngoscopic picture of these conditions may be regarded as the end result of a spill over from the ventricle to the neighboring structures.

The author reports a case of pyocoele of a congenital air sac of the ventricle—an extremely rare condition. The patient had a tumor mass spreading over the anterior half of the left ventricle and ventricular band. The condition was diagnosed as carcinoma of the larynx. After further study the diagnosis was that of pyocoele of a congenital air sac of the larynx associated with secondary inflammatory changes of the true and false vocal cords and the ventricle and simulating carcinoma. The history of this rare and puzzling condition was as follows.

The patient had a congenital atavistic laryngeal air sac like that found in the anthropoid ape. In some way it became infected through its opening into the ventricle. It became filled with pus which constantly leaked over the anterior part of the cord the ventricle and the ventricular band and a chronic inflammation developed with granulation tissue about the parts involved. This granulation tissue in turn dammed back the secretion in the sac in a valve like manner at its point of exit in the ventricle.

The author described another rare case of prolapse of the sacculus of the ventricle of the larynx which occurred as a result of some pathological condition in the neighborhood of the normal sacculus.

Prolapse of the ventricle is a term used to indicate the protrusion of a portion of the ventricular mucosa as the result of inflammatory edema or hyperplasia so that parts of the ventricle which are normally out of sight are carried inward along the swelling and come into view through the laryngoscope. In this case the original clinical diagnosis was that of cyst of the larynx. Not until the pathological report was carefully co-ordinated with the clinical and operative findings was the correct diagnosis made.

A third case described was a laryngocele a comparatively rare condition occurring in an infant. When the child was quiet nothing unusual was noticeable when it cried a sausage like swelling appeared on the right side of the neck starting from the region of the thyroid cartilage and extending obliquely upward and outward to the right angle of the mandible. This swelling was airy to touch and tympanic in percussion. The condition was a probable morphological reversion to the condition existing in the higher apes with a persistent air sac communicating with the ventricle.

MATTHIAS J SEIFERT M D

Orton H B Cancer of the Laryngopharynx *Arch Otolaryng* 1938 28 344

Malignant tumor is frequently found in the small area extending from the tip of the epiglottis to the

opening in the esophagus. Malignancy of the laryngopharynx is extrinsic cancer of the larynx. In this category belong growths in the epiglottis, the aryepiglottic folds, the lateral and the posterior pharyngeal wall, the piriform sinus, and the postcricoid region.

Most lesions in these sites show a surprising degree of advancement before diagnosis is made because of the slow growth of the cancer and the insufficiency of early symptoms. Cancer in the laryngopharynx is not rare. Its manifestations are so common that frequently they are neglected, and diagnosis often is not made until the tumor has made considerable progress.

The usual ages of patients with this type of cancer are between forty and sixty years. The epilaryngeal type of growth is more common in men than in women, whereas the hypopharyngeal type of growth is almost entirely limited to women.

The author has found a close relationship to carious teeth in a large majority of these malignant tumors, which often cause slight enlargement of the cervical glands. Any patient in the age period which is most susceptible to cancer, showing enlargement of the cervical glands, no matter how slight, should be suspected of having cancer until it is proved otherwise. The author points out that any abnormal sensation in this area, which is known to have been present over a period of time, should be regarded seriously. When pain is present, it is usually intermittent. Cancer of the laryngopharynx is usually of the squamous-cell type.

Symptoms generally depend on the site of the lesion. At the beginning there may be some abnormality, such as a tickling sensation, a constant clearing of the throat, or the sensation of a foreign substance which cannot be dislodged. Increased salivation and mucus in the piriform sinus that cannot be emptied by swallowing, are further significant symptoms. Among the later symptoms are alteration of voice, accompanied by choking at or between meals, due to anesthesia or analgesia of the posterior branch of the inferior laryngeal nerve. A late, and too often inoperable, picture presents loss of appetite, difficulty in swallowing, and enlarged, fixed cervical glands.

Gland involvement occurs early. The course is fairly rapid, and if prompt treatment is not under-

taken the patient has but a short time to live. A thorough examination will accomplish much toward an early diagnosis and radical surgical intervention.

The most important feature in diagnosis is the laryngological examination, which should be done with as great thoroughness as for intrinsic cancer of the larynx. Cancer of the laryngopharynx is frequently overlooked because a clear view is not always obtained. A good view of the hypopharynx is essential, the movements of the arytenoids on phonation and inspiration must be observed, and it is necessary to ascertain whether there is mucus in the piriform sinus which cannot be emptied by swallowing. The laryngeal picture may present the appearance of a chronic ulcer with raised margins and depressed ulcerating center, or that of a sessile growth projecting into the lumen. There may be a fixation of the arytenoids, or a large mass filling the cavity. If fixation of the arytenoids is present and no growth is discernible, it is likely that the piriform sinus is the site of the growth. On having the patient say "E," the larynx is elevated and it is possible to see a slight edema below the arytenoids. If the upper edge of an ulcer is seen, a malignant process is indicated. Further study with the roentgen rays, followed by direct laryngoscopic or esophagoscopy inspection and removal of a specimen for biopsy completes the examination.

Thirty years ago a small epithelioma of the lower part of the pharynx meant certain and painful death. Today, thanks to Trotter, good results are obtained in the surgical treatment of carcinoma of the larynx. The operative mortality is very low and the percentage of five-year cures is high, obviously because of early diagnosis.

Treatment and prognosis depend upon recognition of the starting point of the lesion. A growth occurring on the epiglottis may be successfully removed by proper operative procedure. Good results may likewise be obtained by early treatment of the lateral and posterior pharyngeal type of growth. Growths of the piriform sinus, in the epilaryngeal area, and in the postcricoid region of the hypopharyngeal area have the poorest prognosis, however, even in these cases early surgical intervention may be valuable.

MATHIAS J. SEIFERT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Weinbren M Encephalography with Small Quantities of Air (Laruelle) *Brit J Radiol* 1938 11 705

The encephalographic method of Laruelle as practiced by Weinbren is based on the assumption that the three superior ventricles are placed in relation to the sagittal plane with mathematical accuracy in the normal skull and any pathological condition would disturb the relationship of one or another of these ventricles in relation to the various base lines. It is consequently not necessary fully to outline the ventricles as in the original method of procedure of Dandy (1918). To obtain the relationship of the ventricles to the sagittal plane and the base line—a line drawn across the supra-orbital margins—it is necessary to have only a small quantity of air 5 c cm generally being enough and not more than 10 c cm ever being required.

A lumbar puncture is effected with the patient in a sitting position and after 10 c cm of fluid have been allowed to drip out 5 c cm of filtered air are slowly injected. The patient is kept in this original position and the first film is taken from three to five minutes after the injection in the anteroposterior position. Postero-anterior and other views may be taken after a successful picture has been taken in the original position.

The author believes that the Laruelle method may be valuable for the first investigation in any patient in whom encephalography or ventriculography may be indicated. It is simple and safe, causes few if any symptoms and it may be done as an outpatient procedure. It is not claimed that this method can replace encephalography or ventriculography in every case with larger quantities of air but it will demonstrate whether any useful information is likely to be obtained by either of the procedures and its use has been found valuable in cases of cerebral tumors, post-traumatic lesion and epilepsy.

JOHN MARTIN M D

Hardman T G A Position for Radiography of the Fourth Ventricle *Brit J Radiol* 1938 11 726

With the patient's nose and forehead touching the table a lateral roentgenogram is taken following ventriculography in an attempt to outline the fourth ventricle. In the experience of the author the fourth ventricle is visible only when the aqueduct is dilated and the third ventricle is larger than normal. In the normal case the failure of the fourth ventricle to fill may be due to the small size of the aqueduct or to a relatively rapid diffusion of air into the cisterna magna.

A well filled aqueduct and fourth ventricle without deformity or displacement indicates an ob-

struction of the foramina of Majendie and Luschka as might occur in the presence of arachnoiditis of the posterior fossa. Filling defects such as intrad on the ventricular shadow may be due to lesions occupying the space of the posterior fossa. A block of the aqueduct may be due to an inflammatory condition and the absence of displacement differentiates a tumor.

The author disapproves of the use of thorotrast in roentgenological studies of the ventricles.

JOHN MARTIN M D

Vaughan W W The Place of Irradiation in Acromegaly *Am J Roentgenol* 1938 40 660

Two papers on irradiation of the pituitary appear in the November issue of the *American Journal of Roentgenology*. The first deals with the chromophobe adenomas and the second is concerned with the chromophil adenomas. Curiously enough the percentages of chromophil and chromophobe cells in the normal pituitary gland are 37 and 63 per cent respectively and the percentages of chromophil and chromophobe adenomas are the same. The symptoms of the chromophil adenoma are the well recognized symptoms of hyperpituitarism; local pressure symptoms occur late if at all. The sella turcica was normal in 20.3 per cent. The signs symptom and physical findings are carefully laid out and discussed. Of the group of 53 patients 16 were operated upon 19 times without a single operative fatality. Although roentgen therapy often produced very dramatic results the prognosis in acromegaly should be guarded because 39.5 per cent of the patients treated in the eight year period from January 1 1928 to January 1 1936 are already dead. The patient with acromegaly should be under constant medical supervision for the activity of the tumor is variable. Quiescent periods are followed by periods of increased activity. Heronality changes nervousness polydipsia polyuria and headache should be a warning of activity of the tumor. The visual fields should be checked every six months.

The author concludes that irradiation should be tried for the chromophil as well as for the chromophobe adenomas before surgery is used unless there is imminent danger of permanent visual impairment.

ADRIEN VEBBERGHEEN M D

Schmidt E R Rapid Control of Intracranial Pressure *Ann Surg* 1938 108 520

The author discusses the rapid control of intracranial pressure and reports his experience with this procedure.

In certain cases in which increased intracranial pressure must be reduced rapidly and in which the reduction must be maintained an intraventricular ureteral catheter may be employed. The main risk is that of infection of which there was positive

evidence in 6 cases. Two patients recovered and 4 died. The method was employed in 24 cases. It was not used in any case of cranial injury.

The procedure has the following indications: (1) to stabilize patients with long-continued pressure, (2) to aid in diagnosis, (3) to reduce emergency operations after ventriculography, and (4) to heal skin after a cerebral hernia.

ADRIEN VERBRUGHEN, M D

Robertson, E G Intracranial Aneurysms, with Special Reference to Surgical Treatment *Australian & New Zealand J Surg*, 1938, 8 132

As most surgeons of today, the author of this article stands in no small awe of intracranial aneurysms, and, finally, is unable to decide what is the optimal form of treatment of such lesions. It is obvious to him that surgical interference often does more harm than good, and he clearly illustrates this point by several short case histories. In one case treated by ligation of the internal carotid artery the patient remained hemiparetic and developed other untoward symptoms, leaving both the patient and the doctor wondering if the cure were not worse than the disease. Before any surgical procedure, he advocates mechanical pressure for several days, intermittently and as a trial, over the carotid artery on the affected side. He has used "thorotrast" in the roentgenographic location of the lesion, but he recognizes its dangers and actually deprecates its use. He believes that repeated lumbar punctures in the presence of a bleeding aneurysm may be a life-saving procedure.

He points out that aneurysms, especially if calcified, may simulate by symptom and appearance an intracranial neoplasm, and that they are not infrequently the cause of focal epilepsy. He points out also that such lesions may remain dormant until disturbed by a traumatic interference of one sort or another.

JOHN MARTIN, M D

Adson, A W The Treatment of Cranial Osteomyelitis and Brain Abscess *Ann Surg*, 1938, 108 499

In the treatment of cranial osteomyelitis and brain abscess the surgeon should employ supportive measures, such as high caloric diets, and, when the infection is due to staphylococci or streptococci the occasional administration of vaccine and sulfanilamide is helpful.

Osteomyelitis of the skull should be treated similarly to osteomyelitis of other bones, this treatment consists of thorough sequestrectomy and removal of all dead bone. The wound should be cleansed with pure tincture of iodine and, if drainage is instituted, the drain should be removed within forty-eight hours and the scalp closed with sutures of silk worm gut.

The mortality will be lowered in the treatment of cerebral abscess if the surgeon employs some of the same principles that are used in the treatment of suppurative lesions elsewhere in the body.

In cases of suspected cerebral abscess resulting from infections about the ear, with indefinite localizing symptoms or with localizing symptoms and signs that are conflicting, the author has observed the rule of exploration of the temporosphenoidal lobe before exploration of the cerebellum on the side of the infected ear because of the higher incidence of temporosphenoidal abscess.

If, on study of the physical and neurological signs, a suspected abscess cannot be localized, the author believes that performance of cerebral pneumography is justifiable.

Adequate and continuous drainage should be instituted after encapsulation has taken place. If capsules are to be removed, it is better to remove them after the acute infection has subsided.

Rizzi, C Angioplasmic Glioblastoma and Cyst of the Brain (Glioblastoma angioplasmico e cisti dell'encefalo) *Tumori*, 1938, 24 363

In the evaluation of the pathological complex of tumor-cyst of the brain, the difficulty consists in deciding whether there is a primary tumor with secondary cyst formation or a primary cyst formation with subsequent neoplastic proliferation. The literature refers mostly to the former process. Rizzi reports the unusual case of a man, aged thirty-nine years, who had partial block of the anterior part of the left lateral ventricle and died suddenly during a suboccipital puncture. Examination at autopsy showed that neoplastic proliferation had occurred in a cerebral cyst. Numerous tumoral nodes were found in the wall of the cyst and their histological structure revealed that they belonged probably to the group of angioplasmic gliomas, the presence of which has been reported at various times in cerebellar and medullary localizations, but only once in the cerebrum, when it was described by Heller under the name of "hyperplastic cavernous capillary angioma." Macroscopic and microscopic study of the present case revealed the existence of a tumoral complex consisting of a glioma with polymorphous cells and an angioblastoma, the two neoplasms being mixed together and combined with a large cyst containing a clear fluid and considered to be a lymphatic cystoma.

The histological examination of the blastomatous nodes showed that they were secondary formations of the degenerated wall of the cyst, there was no question of a cyst formation from compression of the surrounding cerebral substance by the blastomatous nodes or of the possibility of a cyst formation through necrosis of neoplastic tissue. Besides, various data in the history of the patient aroused the suspicion of a secondary origin of the blastomas of the cystic wall, several traumatic incidents preceded the appearance of the symptoms and one of them, a contuse trauma of the cranial vault, seems to have been the cause of the formation of the cyst through circulatory disturbances.

The secondary origination of the tumor from the wall of the cyst might be explained by the theory of

hydraulic shock proposed by Beneke especially since in many cases the appearance of a cerebral tumor follows a traumatic action abnormal stimulation of the glial elements by repeated hydraulic shocks would lead to gliosis and finally to glomatous proliferation. Certain chemical conditions and especially the presence of the products of disintegration in the focus of softening must undoubtedly be accepted as playing their part. There was a marked hyperplasia of the blood vessels in the tumor which condition also was explained by the action of hydraulic shock on the wall of the primary cyst. The result was an angioma which in the present case was particularly well developed at the anterior pole of the cyst as this was naturally most exposed to the hydraulic shocks. The sudden death of the patient during a suboccipital puncture was explained at autopsy by the presence of a marked edematous swelling of the lower part of the temporal lobe (temporal pressure cone of the French authors) which at the moment when the cerebrospinal fluid was extracted must have been sucked into the foramen of Bichat with compression of the cerebral trunk and fatal result.

RICHARD KEMEL M D

Phillips C Transsphenoidal Decompression for Pituitary Adenoma *Brit J Surg* 1938 26 242

This article presents several arguments in favor of the transsphenoidal approach in the operation for pituitary adenoma.

1. The operation is simpler than with the transfrontal approach.

2. Postoperative hyperthermia is rare after operation by the transsphenoidal route.

3. There is not so much possibility for damage of the frontal lobe with attendant mental deterioration.

4. Sudden death is not nearly so apt to supervene.

As carried out by the author transsphenoidal decompression was performed through one nostril with a special duckbill self retaining retractor. This approach was found to provide adequate exposure of the tumor without the necessity of incisions at the junction of the nose and cheek or beneath the upper lip. The early stages were carried out by an otorhinologist who after submucous resection of the cartilaginous septum removed the vomer and the inferior and posterior parts of the perpendicular plate of the ethmoid bone and thereby exposed the crista sphenoidalis which serves as a guide to the midline. The duckbill self retaining retractor was then inserted opened as widely as possible and the mucous membrane over the concha sphenoidales was displaced until the anterolateral apertures of the sphenoidal sinus were seen. This is an important step in the procedure as it insures an adequate exposure of the anterior wall of the sphenoidal sinus. The anterior wall was then removed and the mucous membrane which lines the sinus was drawn out. When this had been done the sella turcica was exposed and was found in each case to be eroded in several places. The remainder of the sella turcica was then removed with punch forceps and the tumor

was exposed. The tumor was gently separated from the walls of the pituitary fossa with the tip of a small glass sucker tub which was passed around its periphery after this maneuver the tumor could be grasped with pituitary forceps and drawn down into the sphenoidal sinus. During this procedure cerebrospinal fluid gushed forth and continued to drain freely. The nose was plugged with cotton for twenty four hours and the patient kept in Fowler's position to facilitate the drainage of the cerebrospinal fluid. This generally ceased after three days.

The operation as described has for its principal purpose the relief of pressure (either on the chiasma or on the diencephalon) and its results appear to be very satisfactory.

With regard to the risk of meningitis following transsphenoidal decompression the author believes that it is slight provided that the operation is carried out between the layers of mucous membrane on either side of the nasal septum vomer and perpendicular lamina of the ethmoid. JOHN WILTSIE FERRY M D

Pringle J H Traumatic Meningeal Hemorrhage with a Review of 71 Cases *Lancet* 1938 45 741

The author reports his experiences with 71 cases of traumatic meningeal hemorrhage which were observed during the period from 1906 to 1933. Thirty three patients had extradural hemorrhage and of these 19 had in addition a subdural hemorrhage. The types and locations of the hemorrhages are given in short histories of many cases. In addition to the usual history and methods of diagnosis the value of percussion of the skull is emphasized. The normal percussion note was altered by fracture or by an underlying intracranial hemorrhage. The author did not obtain much assistance in diagnosis from the pupil other than that in some cases a wide non reacting pupil was encountered on the same side that the hemorrhage occurred. He stresses the value of the MacEwen pupil and found it was always positive in alcoholic coma. The pupil of the patient in alcoholic coma at rest was contracted but disturbed or if the skin of the face or neck was irritated the pupil dilated widely and returned to the contracted state after the disturbance. This was a most valuable diagnostic sign.

It was noted that a subtentorial decompression may prove to be more effective than supratentorial decompression in many of these cases.

ROBERT ZOLLINGER M D

Rowbotham G F The Treatment of Pain in the Face by Intramedullary Tractotomy *Brit M J* 1938 2 1073

In 1891 Horsley described the first operation on the sensory root of the trigeminal nerve. To Hartley in America (1892) and Krause in Germany (1892) go the credit for the extradural approach through the middle fossa which formed the basis of operative procedures destined to obtain a great measure of success in the succeeding years. Both divided the

trunks of the nerve distal to the ganglion, but Krause in 1893 removed the ganglion itself. In 1901 Spiller and Frazier suggested division of the posterior root, and this modification profoundly influenced all subsequent methods of treatment. Apart from conservation of the motor root, the great advantage of the method is that a fractional anatomical section generally is possible. Immediately behind the ganglion, the nerve fibers run in groups corresponding fairly accurately to the three peripheral trunks, and can be isolated according to their relative positions, the mandibular and maxillary fibers occupying the lower and outer two-thirds of the root. Dandy in 1929 stated that as the posterior root approaches the pons, the fibers conducting the various types of sensation become rearranged into distinct physiological groups. Thus, he believed it possible to divide only those fibers which carry pain impulses. It is doubtful whether this arrangement occurs in all cases, and there is much experimental evidence to disprove it. However, within the brain stem, physiological grouping does take place, and in this location, fractional physiological section is possible. Sjoqvist in 1938 devised an operation in which he was able to divide the pain fibers in the descending limb of the trigeminal tract by an incision through the posterolateral aspect of the medulla oblongata and spare the sensation of touch so that the face did not remain unpleasantly numb.

The author has performed the operation in 3 cases, in 2 for the relief of neuralgia involving the ophthalmic division of the trigeminal nerve, and in 1 for the relief of severe and persistent migrainous headaches. In all 3, the results were very satisfactory. The advantages of the operation are that the face is not denervated completely, analgesia is

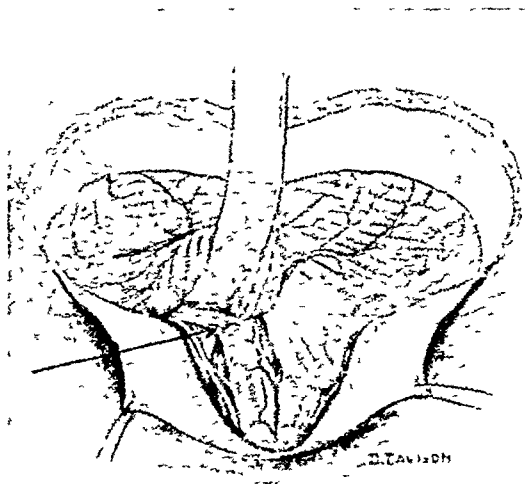


Fig 1 Showing the site of the incision of intramedullary tractotomy

greatest in the forehead, and the muscles of mastication are never paralyzed—an important consideration in bilateral cases. Moreover, the great superficial petrosal nerve (the nerve of tear-secretion) is far from the operative site and therefore the danger of “dry” eye is avoided. Since the loss of tear-secretion is thought to be the main factor in the production of corneal ulceration or “steaming,” the latter troublesome complication which occasionally follows section of the posterior root is also obviated.

ARTHUR S. W. TOUTOFF, M.D.



SURGERY OF THE THORAX

CHEST WALL AND BREAST

Geschickter C F Gelatinous Mammary Cancer
Ann Surg 1938 108 321

Gelatinous carcinoma which is a rare form of mammary cancer occurred 83 times in a series of 2 300 breast cancers. The peak of its incidence is between the ages of forty six and fifty years as compared with the ages of forty-one and forty five years for scirrhous cancer. The discovery of a lump was the first sign noted by the patient in 80 per cent of the cases and in nearly half the known duration of the mass prior to examination was a year or more the average time being four and three tenths years. The average diameter of the tumor in the present series was 4.6 cm. and only 4 tumors were 10 cm. or over in diameter. The most prevalent sites in the breast are the outer upper quadrant and the central zone.

The present study indicates that a variety of mammary carcinomas may undergo mucoid changes which result in typical gelatinous carcinoma. Slowly growing scirrhous cancer, papillary adenocarcinoma and adenocystic basal cell cancer are the most frequent sources for growths in which the characteristic gelatinous material pervades the entire tumor structure.

There are four chief findings on clinical examination which suggest a diagnosis of gelatinous carcinoma: (1) the relatively small size of the tumor in comparison with the long duration of symptoms; (2) the protrusion and enlargement of the nipple on the affected side; (3) the cystic character of the growth on palpation, the growth being differentiated from a benign cyst by a piration of characteristic mucoid material; and (4) the impression of rupture of the delicate membranes or a swish on firm pressure as originally described by Halsted.

Mucoid cancers on gross and microscopic examination may appear to be diffusely or partially gelatinous. The gelatinous material has a characteristic gray translucent appearance resembling tapioca. Microscopically mammary cancers which are diffusely gelatinous originate in papillary cancers, adenocystic basal-cell cancers or slowly growing adenocarcinomas. The mucoid material is secreted by the epithelial cells of the tumor. Cancers showing a partial mucoid change are usually of the scirrhous type.

In the present series 59 of the 83 cases of mammary cancer showed diffuse or typical gelatinous change. Of 45 patients who were adequately traced 34 or 75 per cent had survived the five year period. Six patients eventually died of recurrent disease, one of these surviving sixteen years and another eighteen years after radical mastectomy.

Of 23 patients with carcinoma showing partial mucoid change 20 were adequately traced. Only 5

or 30 per cent survived the five year period. In the present series the five year survivals in all types of mammary carcinoma showing mucoid change (diffuse or partial) amounted to 60 per cent.

JOSEPH K. NARAT M.D.

TRACHEA, LUNGS AND PLEURA

Crafoord C On the Technique of Pneumonec-tomy in Man *Acta chirurg Scand* 1938 81 Supp 54

Crafoord of the Sabbatsberg Hospital in Stockholm reviews the literature on the subject of pneumonectomy and reports his experience with this operation in the cases of 16 patients. The technique which he has developed as a result of his study of the literature and own experimental and clinical work is presented in detail.

The problem of wound infection is the one which has been least satisfactorily solved. In spite of careful protection of the wound from contamination, primary wound healing without any signs of inflammation occurred in only 2 of the 11 patients who survived operation long enough to determine the nature of the wound healing. The author believes that greater attention should be paid to this problem.

The combination of general and local anesthesia is considered best for the smooth accomplishment of the operation. Nitrous oxide or cyclopropane with oxygen was used in each case. Local anesthesia was used regionally for the chest wall infiltration, anesthesia for the mediastinum and endobronchial anesthesia for the mucous membrane.

The use of intratracheal anesthesia facilitated by the use of a specially curved cannula which fits the larynx and pharynx. Tamponade of the bronchus to the affected lung to prevent overflow of infectious material during the operation is maintained by means of a flexible steel sound attached to the gauze plug. Rhythmic injection of the anesthetic mixture followed by the free outflow of air during expiration is accomplished by means of a Frenchner spiropulsator working in combination with an ordinary gas machine. The author believes that this is the only method which provides satisfactory ventilation during the period when the chest cavity is wide open. With its use he has been able to maintain anesthesia for hours without difficulty.

The chest wall incision which has been found to give the best exposure, one which goes through the bed of the fifth rib from its junction with the cartilage to its cartilaginous portion. Through this approach one has good access to the hilus from the front and from the back. Careful preservation of the pericostal allows for air tight closure of the chest wall in layers without the use of pericostal sutures.

In the management of the hilus the dissection of its structures is greatly facilitated by previous

division of the bronchus so that it may be put out of the way. The bronchial stump is clamped with forceps similar to those used in the Trendelenburg operation for clamping the pulmonary artery. In the case of carcinoma, the clamp is applied as close as possible to the bifurcation, and the lymph glands are carefully dissected away. Division of the bronchus is made between the third and fourth bronchial rings below the forceps, and after careful cleansing of the stump with an antiseptic it is held out of way by means of the forceps. The pulmonary vessels are then doubly ligated close to the pericardium so as to avoid the formation of bulging vascular sacs which might aid in the formation of thrombi and emboli. The bronchial artery branches, however, should be ligated as peripherally as possible, to avoid impairment of the blood supply to the bronchial stump.

After the blood vessels have been disposed of, closure of the bronchial stump is accomplished by means of a continuous suture of catgut, re-enforced by interrupted silk sutures after the distal cartilaginous ring has been carefully removed. The corners are invaginated and the whole stump is buried under the mediastinal pleura.

No drainage is used, and the intrathoracic pressure is controlled by the use of aspirations. Paralysis of the diaphragm is not used.

Operation was performed on 16 patients up to March, 1938. Twelve of these had malignant disease and 4 had not, 7 died within eleven days of the operation, and 3 died at later dates, 6 patients survived and were alive from three months to two years after operation. Of the survivors, 3 had carcinoma and 3 had tuberculosis, but in the latter group the clinical diagnosis had been carcinoma and each patient had marked bronchial stenosis.

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RICHARD H. MEADE, JR., M.D.

ESOPHAGUS AND MEDIASTINUM

Penberthy, G. C., and Benson, C. D. *The Management of Certain Lesions of the Esophagus*. *Ann Surg*, 1938, 108: 612.

Lesions of the esophagus are not common when compared with other lesions of the gastro-intestinal tract. The management of these lesions is well standardized nowadays, although some difference of opinion as to the one-stage and two-stage operations may exist.

The danger from perforation of the esophagus lies in its complications. A foreign body lodging in the esophagus or a lesion resulting from a foreign body is frequently seen by the endoscopist.

Pulsion esophageal diverticula need to be recognized early and treated by the two-stage operation, however the results obtained by the advocate of the one-stage operation should be recognized.

Cicatricial stenoses of the esophagus are seen most often in children following the accidental swallowing of lye. When first seen they should be treated conservatively. However, the resultant strictures of the esophagus may sometimes be very resistant to treatment.

The authors give detailed case reports of 3 cases of foreign bodies in the esophagus, 1 case of esophageal diverticulum, 1 case of congenital shortening of the esophagus, 1 case of stricture of the esophagus, and 1 case of rupture of the thoracic esophagus.

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The authors give the following classification of diaphragmatic hernias according to their roentgen characteristics, which are the only ones that allow a precise diagnosis and provide definite surgical indications: (1) congenital hernias (a) thoracic stomach, in which the stomach is in the thoracic cavity and the esophagus is very short, (b) gastric hernia with a short esophagus, in which part of the stomach is above the diaphragm, (c) hernia of the foramen of Bochdalek, (d) hernia of the foramen of Morgagni, (e) absence of the diaphragm, (2) congenital or acquired hernias of the esophageal hiatus (a) para-esophageal hernia, in which the normal esophagus ends below the diaphragm, while part of the stomach is above it, (b) properly called hernia of the hiatus, in which the esophagus is normal but ends above the diaphragm, and part of the stomach is above the diaphragm, (3) traumatic hernias, and (4) diaphragmatic eventration.

The roentgen diagnosis of thoracic stomach does not offer any difficulties and there is no surgical treatment for the anomaly, which is compatible with a long life. In gastric hernia with a short esophagus usually ending at the level of the seventh or eighth dorsal vertebra, roentgen examination in the upright posture shows that the esophagus joins the apex of the upper part of the stomach, which appears as a dilated portion of the esophagus; study of the folds of the esophageal and gastric mucosae establishes the differential diagnosis from dilatations and strictures of the esophagus. Hernias of the esophageal hiatus constitute the most frequent type of non-traumatic diaphragmatic hernias. In para-esophageal hernia, roentgen examination in the upright posture may be negative in small hernias, and may show an air pocket superimposed on the cardiac shadow and a mobile fluid level in large hernias, but roentgen examination in the recumbent (Trendelenburg) dorsal posture generally demonstrates filling of the herniated portion, which is emptied in the ventral posture. Differentiation of this hernia from the other types requires examination of the terminal portion of the esophagus by means of complete filling with an opaque substance or by means of a thin coating of opaque substance in order that it may be

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determined whether the esophagus enters the stomach below the diaphragm. In properly called hernias of the hiatus roentgen examination in the upright posture raises suspicion because of the displacement of the lower portion of the esophagus and its angulation, the delayed passage of the opaque substance into the stomach and the temporary formation of a pocket having the aspect of a diverticulum or of a dilatation in the terminal part of the esophagus. Examination in the Trendelenburg posture confirms the presence of a herniated segment of the stomach.

It is evident that the exact diagnosis of the type of diaphragmatic hernia present requires a roentgenological examination in various positions and from various angles. Although the best films are obtained in the Trendelenburg posture, a most important factor is the upright posture, except in paraesophageal hernias in which examination in this posture is usually negative; however, this negativity allows exclusion of a gastric hernia with a short esophagus and of a properly called hernia of the hiatus and thereby raises the suspicion of a paraesophageal hernia.

Hernia of the hiatus may not cause any symptoms, but the majority of the patients present digestive disturbance of intermittent and generally progressive incarceration or obstruction of the stomach, while some show cardiovascular or cholecystic manifestations. The digestive symptoms which suggest the presence of a hernia of the hiatus are intermittent non progressive dysphagia, a sensation of gastric fullness after small meals and the early temporary occurrence of painful disturbances after eating with relief in certain postures or after eructation or vomiting and hydroaerial noises.

RICHARD KEMEL, M.D.

Divis J. A Contribution to the Clinical Study and Surgical Treatment of Benign Tumors of the Mediastinum (Contribution à l'étude clinique et au traitement chirurgical des tumeurs bénignes du médiastin). *J. de chir.* 1938 52 69.

The author reports 10 cases of benign mediastinal tumor. In cases of mediastinal goiter diagnosis may be difficult, especially when the goiter forms a solid nodule completely detached from the thyroid gland or has an atypical localization in the posterior mediastinum. In the surgical removal of mediastinal goiter, an auxiliary sternotomy will be found of great value for entrance into the upper mediastinum. An incision is made in the sternum for several centi-

meters from the sternal incision downward in the mesial axis. One may thus proceed without injury to the pleura or large vessels and the opening permits the introduction of one or two fingers for extrusion of the tumor. By this means the operation may be considerably shortened.

Among the nerve tumors of the mediastinum are mentioned neurofibroma, neurinoma and ganglioneuroma of the sympathetic system. These are located usually in the posterior mediastinum and may be of an hourglass shape. They are usually benign and produce but few symptoms, such as slight dyspnea and pain. They may occur at any age, some times even in infancy and may attain considerable size. Radical surgical removal gives good results.

Connective tissue tumors of the mediastinum include lipoma, fibroma and chondroma, and the author reports a very rare case of plasmacytoma.

About 200 cases of dermoid cysts and teratomas of the mediastinum have been reported. These too may appear in infancy and may attain a great size. They have been explained as monogerminal tumors. Of 190 cases reported by Hedblom, 86 terminated fatally without operation. Operation was performed in 104 cases. Radical extirpation was done in 50 cases with cure in 36 or 78 per cent. Partial intervention was accomplished in 56 cases with satisfactory results.

One of the rarest of benign mediastinal tumors is cystic lymphangioma, which has been attributed to the mediastinal penetration of cystic cervical lymphangioma. Purely intrathoracic tumors like the one described are probably of some other origin, possibly engrafted on rests of aberrant vessel.

Dermoid and other cysts are usually easily accessible because they are monolocular, but the extraction of cystic lymphangioma is very difficult because it is only vaguely limited by the surrounding organs and contains multiple cysts, some of which are small and cannot be removed; hence there is danger of recurrence.

Aneurysms of the aorta and of the anonymous artery greatly resemble mediastinal tumors in their clinical symptoms. It is usually easy to diagnose small aneurysms, but large aneurysms may present great difficulties in the differentiation from tumor, especially when they are located on the descending aorta. In aneurysm surgical treatment is futile. Antisyphilitic and general hygienic measures are indicated. One reason for the prompt surgical removal of benign tumors of the mediastinum is their potential malignancy. EDITH SCHACHE MOORE.

DELAYED INTERVENTION IN APPENDICEAL ABSCESS AND SPREADING PERITONITIS DUE TO APPENDICITIS

Collective Review

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PROBABLY nowhere in the entire domain of medicine and surgery is there a therapeutic procedure attended with more brilliant results than those obtained from the surgical removal of the vermiform appendix for acute appendicitis, provided that the operation is performed during the early stage of the disease. The postoperative complications are few, the operative mortality is practically negligible, and the end-results are excellent. Unfortunately, however, such a happy outcome of this disease does not always follow, as is indicated by the fact that some 20,000 deaths from appendicitis occur each year in the United States, and there is some evidence to show that this death rate is increasing [Sperling and Myrick (78), Walker (87), Hobler (33)].

Deaths from acute appendicitis are due almost solely to some phase of peritonitis, whether it be directly (from toxemia, profound sepsis, and ileus) or indirectly (from the later complications of peritonitis, such as intestinal obstruction, intestinal fistulas, subphrenic abscess, empyema, or pneumonia). It is therefore obvious that the mortality is largely dependent upon the incidence of perforation and that if in all cases of acute appendicitis an early correct diagnosis were made and appropriate treatment applied, the death rate would promptly fall to a low level.

That much can be gained by an active program of lay education has been demonstrated in Philadelphia where an attempt was made by the Department of Public Health to attain earlier hospitalization of patients with acute appendicitis, where the public was taught the importance of abdominal pain and the necessity of early medical consultation, as well as the danger of promiscuous and common use of cathartics and purges in attempts at self-medication. Without doubt if the pernicious practice of purgation for abdominal pain could be abolished countless lives would be saved.

The present high death rate from acute appendicitis is a challenge to the surgeon in his management of the ruptured case, complicated as it is by

some degree of peritonitis. Thus Sworn and Fitzgibbon (83) reported a mortality rate of 21.1 per cent in a series of 226 cases of general peritonitis at St. Thomas' Hospital, Finney (23) 22.08 per cent in 240 similar cases, Haggard (29) 24.7 per cent in 186 cases, Keyes (41) 27.55 per cent in 98 cases, and McClure and Altemeier (56) 21.5 per cent in 65 cases (46.6 per cent in 15 cases of general peritonitis plus abscess). These same authors give the mortality for cases with localized abscess as follows: Sworn and Fitzgibbon, 4 per cent in 487 cases, Finney, 4.56 per cent in 438 cases, Haggard, 5 per cent in 379 cases, Keyes, 7.3 per cent in 315 cases, and McClure and Altemeier, 4.2 per cent in 117 cases.

That the mortality of appendicitic peritonitis is excessively high is not a new observation. As long ago as 1902 A. J. Ochsner (61, 62) in speaking of acute appendicitis stated that "in fatal cases, the patient practically always dies as the result of diffuse peritonitis." In considering the spread of infection from the appendix, he maintained that the normal anatomical arrangement of the adjacent structures was extremely efficient for the walling off of infections and the prevention of spread to the general peritoneal cavity. He believed that the failure of the normal defensive mechanism to limit an inflammatory process to the right iliac fossa was due largely to the peristaltic waves of the small intestine, and that if peristalsis was active it might be responsible for the dissemination of the infection throughout the general peritoneal cavity. He further believed that intestinal peristalsis could be inhibited by the abstinence of food and fluid by mouth, and contended that with the intestine at rest the omentum was materially assisted in its attempts to localize the infection. He then enumerated his three cardinal points of treatment: (1) complete avoidance of food or fluids by mouth, (2) abolition of cathartics or large enemas (although small nutrient enemas were permitted), and (3) removal of the stomach contents by gastric lavage. In 1892 he began to employ this so-called Ochsner treatment in preference to immediate operation. It is noteworthy that his mortality in cases with early diffuse peritonitis dropped to less than one-fourth

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of what it was formerly when operation was promptly performed.

Sherren (74) in 1905 while insisting upon appendectomy for cases seen within from the first twenty four to thirty six hours of the disease believed that when seen later than this they should be lided over the attack by means of conservative measures and appendectomy performed at a later date. His mode of treatment in these cases was similar to that of Ochsner. The English frequently speak of the Sherren treatment and the term

Ochsner Sherren treatment is one quite generally used.

In 1894 Richardson (70) stated that in his opinion there were some cases seen too late for the early operation and too early for a safe late operation. This dangerous period was believed by him to be during the third fourth or fifth day of the attack. While not an advocate of routine deferring of operation in such cases he pointed out the dangers of breaking down protective adhesions and favoring the spread of infection in the peritoneal cavity by a badly timed operation.

In spite of the teachings of Ochsner and Sherren the conservative treatment of appendiceal peritonitis has never been very generally adopted by surgeons even though the mortality of general or widespread peritonitis has remained consistently high when early operation was performed.

Jopson and Pfeiffer (38) writing in 1923 stated that the method of deferred operation has never commanded anything like universal attention and it seems to us from a review of the literature of the last six years that it is perhaps less popular today than when we last reviewed the subject in 1916.

In 1926 Guerry (28) reported a mortality of 8.2 per cent in 85 cases of general peritonitis treated by immediate operation with a mortality of only 1.6 per cent in 123 similar cases treated by deferred operation. Treatment in these cases was exactly according to the principles laid down by Ochsner. Guerry's report of his results in cases of diffuse peritonitis which were superior to any previously recorded has caused a renewal of interest on the part of surgeons in the Ochsner plan that is delay of operative intervention.

Wilkie (88) an eminent authority on appendicitis stated in 1929 that he usually advised immediate operation once the diagnosis had been made. Continuing however he states that in dealing with cases of localized peritonitis considerable judgment is required and expectancy may not infrequently be justified.

Coller and McRae (16) reviewing in 1930 the results of treatment of acute appendicitis over a five year period at the University of Michigan

Hospital found the mortality in the peritonitis group to be 52.6 per cent (or 21 per cent if 3 patients actually moribund at the time of admission were excluded). Because of this shockingly high mortality the practice of immediate operation in this group of cases was abandoned in 1931 and a program of delayed operation adopted.

During the past several years a tremendous amount of literature on the subject of delayed versus early operation in cases of acute appendicitis complicated by rupture has appeared. While as yet there is no unanimity of opinion in the matter and ardent proponents of both methods of treatment are to be found the advocates of deferring the operation at least for a sufficient period of time to permit restoration of physiological balance seem to be increasing in number. Considerable difficulty is experienced in the attempt to summarize and reconcile the opinions of various authors because of the lack of uniformity and of standardization in the use of terms. Thus such phrases as local localized early diffuse diffusing and early general peritonitis lead to many different interpretations. For example a case of very recent perforation with soiling and consequent congestion and exudation of the regional peritoneum may on the one hand be grouped with the cases of simple acute appendicitis, or it may be classified under the general heading of early diffuse or early general peritonitis. In case the latter classification is used it explains the recommendations of certain writers for early operation in cases of diffusing peritonitis and should many such cases be included in the general peritonitis group a statistical review of the cases may be made to show very good results from prompt operation in cases of general peritonitis.

Too much emphasis cannot be placed on the fact that the expectant form of treatment is not designed as a method of treatment of uncomplicated acute appendicitis. On the contrary it is proposed for certain complications i.e. circumscribed or non circumscribed peritonitis caused by perforation of the appendix. The treatment of simple acute appendicitis is appendectomy. Likewise in borderline cases in which there is doubt as to whether or not perforation has occurred the majority of surgeons favor prompt operation especially when the patient is seen during the early hours of the attack. The consideration of a waiting policy should arise only when little doubt exists that rupture has occurred. In cases operated on within the first few hours following perforation the results of early intervention are on the whole excellent. The patient's condition is good important adhesions have not as yet had a chance to

form, and experience has shown that the mortality is only slightly higher than in the unruptured cases

While the time at which perforation occurs cannot always be told with accuracy, and while the duration of the attack is not always a reliable index of the stage of the disease, generally speaking the unperforated cases and those very recently perforated will ordinarily be seen within the first forty-eight hours. Very commonly the diagnosis of recent rupture is made only at the time of operation, and since this diagnosis is quite frequently not made pre-operatively, it is convenient and proper to group cases with recent rupture along with those of simple acute appendicitis. Because the end-results of operation are so uniformly good in these cases of very early rupture, certain authors [Babcock (1), Maes and McFettridge (55)] who believe that a history of sudden cessation of pain is indicative of perforation insist that prompt operation should be performed in such instances. Others [Maes *et al.* (52, 53, 54), Trunca (86), Bailey (2), and Haggard (29)], also believing that a history of the ingestion of a purge makes the probability of perforation great, advise immediate operation in cases with such a history.

TYPES OF ACUTE APPENDICITIS WITH PERFORATION FOR WHICH DELAYED OPERATION MAY BE EMPLOYED

1 Cases with localized inflammatory infiltration

In contrast to the group of cases with recent perforation to which reference has already been made, in these cases a longer period of time has usually elapsed following the perforation, the patient being seen more than forty-eight hours after the onset of the attack, usually during the third, fourth, or fifth day of the disease. In turn, the defensive mechanisms of the peritoneum have had a chance to begin their combat against the spread of the infection in the effort to wall off the process from the general peritoneal cavity. Loops of small intestine and the greater omentum have become agglutinated to the appendix and cecum, and adhesion formation has begun. While a small amount of pus may be present, this type of case is to be distinguished from the large monolocular abscess. There may be multiple small abscesses in or beneath the thickened and edematous omentum. These cannot be drained surgically, and even though a tumor mass can be detected on abdominal or rectal examination, it will be found to consist principally of inflamed thickened and edematous tissues. It is obvious that drainage operations can accomplish but little in such cases, since as a matter of fact there is little or nothing to drain. Re-

moval of the appendix at this time is particularly hazardous, justifying the traditional fear of the so-called danger period from the third to the fifth day (negative phase). Operation is dangerous because even with the greatest care, protective adhesions are broken down, nature's barriers are destroyed with consequent spread of the infection to uncontaminated portions of the peritoneal cavity, and there is a real possibility of conversion of a local into a general peritonitis. Furthermore, it may be difficult to find the appendix and a prolonged search for it becomes necessary. Moreover, the tissues are vascular, friable, and edematous, so that troublesome bleeding is not uncommon and trauma to the ileal or cecal walls may result in the distressing complication of a fecal fistula. It is impossible by any type of surgery completely to eradicate the inflammatory process, as in the cases in which the process is limited to the appendix.

Delay of the operation, on the other hand, provided the patient can be carefully watched in a hospital and is kept at rest in bed with peristaltic activity reduced to a minimum, will allow the inflammatory process to subside, and appendectomy may safely be performed at a later date as an interval operation. In the event that extensive suppuration follows, the resultant abscess can be dealt with according to established surgical principles, although according to many present-day writers the indications for surgical intervention in such cases are becoming more strict.

Those who advocate early operation in this group of cases do so in the belief that prompt removal of the appendix, once the diagnosis of acute appendicitis is made, is the treatment of choice in all cases, irrespective of the stage of the disease, and that early removal of the focus of the infection is most essential.

2 Cases of appendix abscess

It is quite impossible to make a fine distinction between the masses due to inflammatory infiltration and those due to abscess formation. In fact, the latter may be regarded as a more advanced stage of the former, just as elsewhere in the body the brawny induration of an early cellulitis may pass on to the stage of suppuration. In these cases the fact that the peritonitis is circumscribed and localized is indicative of a satisfactory resistance to the infection, particularly on the part of the peritoneum. Love (50, 51) regards abscess formation as the most fortuitous outcome of a ruptured case, and states that in such cases we are truly dealing with the "laudable pus" of our forebears.

In the more advanced stages the diagnosis of abscess is not difficult. A large mass may be felt

frequently bulging into the rectum and presents definite softening or even fluctuation. Relaxation of the anal sphincter often occurs and diarrhea may be present. In such cases especially in children edema of the genitalia may develop. Such an abscess may spontaneously rupture into the rectum, bladder or vagina; it may enlarge upward and medially and point toward the free peritoneal cavity; it may travel upward along the paracolic gutter to form a subdiaphragmatic abscess; it may burrow posteriorly into the retroperitoneal tissues and occasionally may travel downward beneath Poupert's ligament to point on the surface of the thigh. In years gone by surgical intervention has been advised in those cases in which there was unmistakable evidence of the presence of pus in accordance with the old surgical axiom *ubi pus ibi evacua*. Adequate drainage of the abscess cavity has been the main purpose of the operation and removal of the appendix at this time was practiced only when the organ could be easily found and easily removed.

3. Cases of general peritonitis. By far the most unfavorable course of the disease following perforation is seen in the spread of the infection throughout the general peritoneal cavity with the production of a generalized or diffuse peritonitis. Here because of low resistance on the part of the host or a particularly virulent organism or combination of organisms, localization of the infection does not occur. Certain authors [Wilkie (88-89), Hertzler (32)] hold that early and sudden perforation of the appendix is frequently responsible for this type of case, believing that the unprepared peritoneum cannot cope with the infection when it is so suddenly flooded with fecal material, a condition which takes place following perforation in the obstructive type of appendicitis.

It was for this type of case that Ochsner originally suggested the conservative form of therapy which still bears his name, and it is concerning the treatment of these cases of general peritonitis due to perforation of the appendix that considerable controversy still exists. The purpose of the expectant treatment is to improve the patient's general condition by the parenteral administration of fluids, electrolytes, glucose and transfusions if necessary, and to assist him in combating his infection by supportive measures including general and intestinal rest, the latter being achieved by duodenal suction. By withholding food and fluids by mouth the general peritoneal inflammatory process is permitted to become localized and when definite abscess formation has taken place these collections of pus may be drained and the surgical procedure carried out at a time when the

patient is better able to withstand a surgical operation.

The advocates of early operation in such cases are no longer able to argue for drainage of the peritoneum as the futility of drainage of the entire peritoneal cavity has long since been demonstrated [Lates (91), Buchbinder (11)]. In fact many of the advocates of early operation in general peritonitis now favor tight closure of the deep layers of the wound with drainage of the superficial tissues of the abdominal wall only and their principal argument for early operation is the removal of the appendix as they consider it important that the original focus of infection be removed. It is argued by some that in these cases of general or non-circumscribed peritonitis there is an absence of protective adhesions in contrast to the finding in cases of circumscribed peritonitis. They therefore believe that prompt operation will do far less harm than in the latter type of case. Thus there is a considerable group of surgeons who heartily endorse expectant treatment for localized abscesses or infiltrations but with equal enthusiasm recommend early operation in cases of general peritonitis.

OCHSNER TREATMENT

The details of the Ochsner regime are essentially those originally emphasized by Ochsner. The patient is put to bed in the semi-Fowler position with heat to the abdomen either by means of hot applications or an electrical heat. Morphine is used freely in order that the patient may be drowsy and contented and kept as quiet as possible. A point stressed by Ochsner was the rule that absolutely nothing was to be given by mouth. At the present time the necessary fluids consisting of 5 per cent glucose solution and occasionally with physiological saline or Ringer's solution are given by the intravenous route. The twenty-four hour fluid intake for an adult ranges between 3,500 and 5,000 c.c.m. At least 1,500 c.c.m. of urine should be excreted daily. Ochsner originally suggested gastric lavage for removal of the stomach contents. The modern method of keeping the stomach empty is by the use of the duodenal tube with Wangenstein suction. Enemas are contraindicated and fluids are not administered by way of the rectum. The gastrointestinal tract is given as complete rest as possible. Usually considerable improvement in the patient's condition is noted within the first twenty-four hours after treatment is started. The temperature and pulse rate begin to drop, the abdomen becomes less distended and the general condition improves. Abdominal distention subsides and vomiting ceases.

In the course of a few days the temperature usually falls to normal and at this time small amounts of fluid can be started by mouth. The twenty-four-hour daily urine output is carefully charted, the blood chlorides and serum proteins are frequently checked, and disturbances in body chemistry are promptly corrected by appropriate therapy.

REVIEW OF THE LITERATURE

Among the most notable contributions to the literature on the subject of deferred operation within recent years have been the papers by several British surgeons. Love, writing in 1924 (49) and again in 1933 (51) on a study of the mortality of operations performed on the different days of the attack, showed that operations performed on the third, fourth, or fifth day carried the highest mortality. The mortality on the first day was 11 per cent, on the second day 2.8 per cent, and from the third to the fifth day 10.2 per cent. After the fifth day the mortality declined as the duration of the attack lengthened. He believed that during this dangerous period from the third to the fifth day the resistance of the patient is at its lowest point, that the natural immunity has become exhausted and acquired immunity has not yet become established, and the patient is in what is spoken of as a "negative phase." He regards the disappearance of cutaneous hyperesthesia above Poupart's ligament (the presence of which denotes a distended but unruptured appendix) as good evidence of perforation, and in such cases, as well as in cases first seen between the third and the fifth days, advises delayed intervention. He concluded that in the cases treated by the delayed plan the mortality was only one-half of that occurring when cases were operated upon immediately. He noted that the expectant plan of treatment was apt to be less successful at the two extremes of life. He found complications approximately three times as numerous in the cases operated on at once as in those treated conservatively. He insisted that the delayed form of treatment should be attempted only in a hospital and formulated his rule of the four F's of treatment: (1) Fowler's position, (2) fomentations, (3) fluids only (saline by any convenient route, only a minimal amount of water being allowed by mouth), and (4) four-hourly chart, indicating careful observation. Under certain circumstances he believed the surgeon's hand might be forced. Thus, if after twenty-four hours of expectant treatment the pulse rate and temperature fail to fall or the patient is complaining of increasing pain and discomfort, operation may be indicated. His mortality in this unsuccessfully delayed group was 6.4 per

cent. In the event that abscess formation occurs the abscess is allowed to absorb unless it increases in size or the patient shows marked symptoms of toxemia. In these cases incision and drainage of the abscess without attempt at removal of the appendix is indicated. He believes, however, that in approximately 65 per cent of the cases spontaneous resolution of the inflammatory process will occur, and a clean appendectomy can be performed some three months later.

Evidence along similar lines is presented by Stanton (79) as the result of an analysis of his own cases and those recorded in the literature. He is convinced that the operative mortality of acute appendicitis is definitely related to the duration of the inflammatory process. This, he believes, is represented by the time interval between the onset of the attack and the time of operation. He notes that when the operation is performed during the first twenty-four hours of the attack, the mortality is practically negligible or in the neighborhood of 1 per cent. The mortality is 2 or 3 per cent in operations performed during the first half of the second day, but after forty hours the rate rises rapidly and thus operations performed during the third day are attended with a mortality of 10 per cent. He believes that operations on the fourth and fifth day are even more dangerous than on the third day. However, beginning with the sixth day the operative mortality begins to decline and by the end of the ninth or tenth day it has dropped back to approximately the level of the cases operated upon during the second day. He believes that the mortality is definitely related to the peritoneal involvement and is convinced that in these cases and in the later cases the mortality can be lowered by deferring operation and resorting to the Ochsner régime.

Sworn and Fitzgibbon (83) in an analysis of the results of treatment of 2,126 cases of acute appendicitis at St. Thomas' Hospital over a ten-year period conclude that in cases in which a palpable mass is present conservative treatment is the procedure of choice. However, in certain of these cases "urgency of symptoms" may make immediate operation necessary. In such cases they believe that the surgical procedure should be confined to drainage of the abscess. For cases of diffuse peritonitis they advise and practice immediate operation, as according to them "removal of the appendix would appear to be the only rational form of treatment to adopt." When appendectomy is performed, drainage of the peritoneum seems to be of minor importance.

Sherren (75), in commenting on his twenty years' experience at the London Hospital, states

The only change I have made has been to greater conservatism and more patience in dealing with cases of appendix abscess.

Bailey (2) in discussing the rationale of the Ochsner-Sherren treatment of appendix peritonitis states that this plan of treatment is not merely postponement of the operation nor a substitute for operation but rather it is a preparation for operation and he insists that it should always be carried out in a hospital the patient being carefully watched so that surgical intervention can be carried out at any time should the necessity for it arise. His rule for the application of the conservative regime is as follows. In cases of over fifty hours duration conservative treatment is to be considered with the following exceptions (1) when hyperesthesia is present which he believes indicates an unruptured appendix (2) in patients under five years of age (3) in cases in which a differential diagnosis cannot be made so as to satisfactorily exclude perforated peptic ulcer and other perforating lesions (4) in cases in which general peritonitis has developed and (5) in cases in which there is a history of recent ingestion of a purge. He states that after six and one half years of experience with this method of treatment he has nothing but praise for it. In enumerating its advantages he concludes that subphrenic abscesses are almost unknown, pyelophlebitis has not occurred and intestinal obstruction is much less common than in cases treated by immediate operation. In cases of general peritonitis in which the patient's condition is critical as shown by a pulse rate of 140 or more with a boardlike abdomen and other unmistakable signs of general peritonitis he believes that conservative treatment is best and that by this method nature is aided in transforming a general peritonitis into a condition of localized abscesses. However in cases of general peritonitis when the patient's condition will permit he believes that the expeditious removal of the appendix with suprapubic drainage is the best form of treatment.

Wilkie (89) states that just as early operation is beneficent and life saving in the obstructive cases so may it be needless and dangerous in the cases seen late where nature has walled off the infection and an inflammatory lump has formed. He believes that in such cases the patient should be kept in the hospital and observed. If the pulse and temperature do not rise the process should be allowed to resolve. On the other hand if a large abscess is present when the patient is first seen it should be opened in the simplest manner possible. No search is to be made for the appendix if it is not seen presenting in the wound. In ruptured

cases the infection is produced in large part by many anaerobes and the danger of cellulitis of the abdominal wall is ever present even though the focus of infection is removed and the pelvis drained. Wilkie therefore advocates leaving the abdominal wound practically open. It may be packed lightly with gauze. He cautions against the use of catgut sutures which he believes act as a pabulum for anaerobes. Hydrogen peroxide irrigations are subsequently given and a prophylactic dose of serum for gas infection is given at the time of operation. He states that in a bad case the presence or absence of a cellulitis of the abdominal wall may be the factor which determines the outcome.

Bevan (4) in discussing acute appendicitis and its complications agrees with other authors that in cases seen within the first twenty four hours immediate appendectomy should be performed. He believes that in this group of cases the mortality will be about 1 per cent. In cases seen during the second twenty four hours of the disease he likewise advises early operation but in these cases the mortality rises to between 2 and 3 per cent. When a patient is first seen during the third fourth or fifth day he believes that the case should be carefully studied in order to see if the process is still progressing or if walling off is taking place with a general improvement in the patient's condition. If the symptoms are progressing and there is a possibility of general peritonitis prompt operation is definitely indicated. If on the other hand the symptoms are subsiding a waiting policy is in order. If a mass forms and shows a tendency toward involution conservative treatment should be advised. In such cases appendectomy should be performed in from six to eight weeks after recovery from the attack. If there is a definite abscess formation extraperitoneal drainage is indicated and this may often be through the vagina or rectum. Bevan makes no fine distinction between an inflammatory mass about an inflamed appendix and a frank abscess. He believes however that such inflammatory infiltrations should be left alone whereas obvious abscesses should be drained. He notes that one half of the patients with inflammatory masses going on to recovery without surgery have recurrent attacks in the future and therefore urges removal of the appendix after recovery from the attack. However in the patients with abscess in which drainage has been necessary recurrences in the future have been far less common and in these cases it is not as necessary to insist upon appendectomy. Bevan believes that if an abscess is drained and a fecal concretion is removed only

about 5 per cent of the patients will have a recurrence of their trouble. In the management of cases of general peritonitis he follows the Murphy plan, which consists of early operation with removal of the appendix. At this time he also makes a small counter incision above the symphysis and introduces a tube into the pouch of Douglas. He then washes the peritoneal cavity with one gallon of normal salt solution at 105° F. He believes this irrigation procedure to be of great value and that it will save countless lives. He emphasizes the necessity of adequate drainage and condemns the practice of tight closure of the abdominal wall in cases of peritonitis.

Babcock (1) calls attention to the dangerous types of appendicitis. In these types he believes that operation should usually be delayed. He groups the patients according to the following plan: (1) those with an initial or secondary chill indicating that toxic infectious material is entering the blood stream or raising the question of the existence of a pyelophlebitis, (2) those exhibiting the occurrence of diarrhea, which is often indicative of a very septic type of appendicitis, quite likely to be due to a virulent, streptococcal, or pneumococcal infection, (3) those showing mental excitation, delirium, or coma, (4) those with clammy skin, cold extremities, high rectal temperature, with black or yellow offensive vomitus, and (5) those with an abscess in the process of localization. However, when a sudden lull in the symptoms occurs he advises prompt operation. He remarks that in cases more than forty-eight hours old, and in which there is evidence of much free pus in the abdomen, much of this pus will be absorbed and an abscess will form about the appendix under a régime of absolute rest. If, however, the patient is very toxic or there is a spreading peritonitis, and any operation is to be performed, simple drainage without search for the appendix is advised. He prefers for this a small muscle-splitting incision. In localized abscesses in the right lower quadrant he urges extraperitoneal drainage through a muscle-splitting incision, warning against drainage through the peritoneal cavity. For larger abscesses in the lower pelvis drainage through the rectum is recommended.

Bower, Burns, and Mengle (8) stress the importance of peritonitis as the cause of death in cases of acute appendicitis. A considerable group of these cases of peritonitis are operatively induced. The factors responsible for such operatively induced peritonitis are the failure of recognition before operation of rupture with a localizing process, and also failure of recognition of such a process at the time of operation and the consequent perform-

ance of radical surgery, such as removal of the appendix, under these circumstances. These authors emphasize the importance of correct diagnosis of a localizing process which may be going on to abscess formation. If such a process is present, conservative treatment is most certainly indicated. They stress the danger of the liberation of antigen into the peritoneal cavity by the trauma of an ill-advised operation during the period of localization, and believe that the amount of antigen liberated when the appendix is removed under such circumstances is sufficient materially to increase the mortality. They emphasize the value of spinal anesthesia and of preperitoneal palpation at the time of operation in order to avoid meddlesome surgery. They likewise present clinical and experimental evidence to the effect that the incidence and also the mortality of spreading peritonitis in man and dog are increased by the administration of laxatives. They believe that the administration of perfringens antitoxin will reduce the mortality of spreading peritonitis because of the fact that the clostridium welchii could be demonstrated in the flora of spreading peritonitis in man and the dog in 60 per cent of the cases.

Haggard (29) emphasizes the increased danger when the disease has spread beyond the confines of the appendix. He refers to the fatal third or fourth day and states that it is not improbable that some of these cases would be better off if not operated upon during that particular period. He places in the same class as important factors responsible for death, conservative treatment given early and surgical treatment given late in the disease. He states emphatically that in the majority of cases there is no conservative treatment after a purgative has been given. He quotes both Ochsner and Lord Moynihan as favoring conservative treatment in these late cases when a purgative has not been given. He cautions against the removal of the appendix when a well walled-off abscess is being drained because of the breaking down of important adhesions. He notes that if an enterolith is found in the abscess cavity at the time of drainage, even though the appendix is left in, rarely will the patient have further trouble. He emphasizes the point that if the Ochsner plan of non-interference is decided upon, this conservative treatment should be continued, and that the surgeon should not change his course and operate upon the patient while the process is still severe.

Sperling and Mynck (78) reviewed 518 cases of acute appendicitis which occurred in the University of Minnesota Hospitals from 1932 to 1935. Since 1929 cases showing extension of the infection beyond the appendix have been treated con-

servatively. They find that in the case of inflammatory masses frequently the mass will disappear and surgery may be postponed until a later date at which time an interval appendectomy is performed. If on the other hand definite evidence of abscess formation is noted drainage of the abscess is performed in an extraperitoneal manner. They believe drainage of these abscesses by way of the rectum is attended with considerable danger while colpotomy drainage is relatively safe. While they believe that the results in cases of abscess or localized inflammatory masses have been improved by conservative treatment they are not able to present statistical evidence to show that cases of general peritonitis treated conservatively do better than those treated by prompt operation. However in spite of statistical data they believe that in general patients with diffuse peritonitis treated conservatively will do better than those operated upon promptly.

Kurtley and Daniel (42) in a study of 1000 consecutive cases of acute appendicitis found 314 patients with ruptured appendixes, 128 patients had appendiceal abscesses. Five of the last group died which gave a mortality rate of 4.2 per cent. Immediate operation was performed in 63 of these cases and delayed treatment practiced in 55. All of the 5 deaths occurred in the group of 55 in which operation was delayed. In the group of cases of spreading or generalized peritonitis there were 103 cases with 38 fatalities or a mortality rate of 36.9 per cent. Operation was deferred in 25 cases and in this group 8 patients died a mortality rate of 32 per cent for the group with deferred operation. This rate was lower than the mortality rate for the group operated upon immediately which was 38.5 per cent. These authors believe that each patient must be considered individually and if delay of operation is decided upon ample fluids and morphine should be given the surgeon reserving the right to intervene if the patient does not respond to the conservative measures. They deem drainage of the right iliac fossa and of the pelvis important when the appendix is ruptured and free pus is present. The complications of intestinal obstruction and fecal fistula were rare in their experience. These authors emphasize the fact that delay in operation is justified only when it is quite certain that the appendix has ruptured and that the peritonitis is not spreading or when it seems probable that the general condition of the patient may be improved. If there is any doubt about the question of rupture or non rupture immediate operation should be performed.

Coller and Potter (17) report their experiences over a period of three years with cases of general

peritonitis treated by the method of delayed operation. During this time 336 patients were admitted to the University of Michigan Hospital with a diagnosis of acute appendicitis. Among this number there were 85 with spreading peritonitis and for them the deferred operative treatment was carried out. The average duration of the disease was three and one tenth days before entering the hospital. Every case was considered on its own merits and deferred operation was not carried out unless the patient was seen in consultation with a senior surgeon. The conservative treatment carried out was essentially that originally outlined by Ochsner. Among the 85 cases so treated there were 8 deaths a mortality of 9.3 per cent. In the 77 patients who recovered the inflammatory process subsided without operation in 29, a localized abscess developed in 48, in 32 of which drainage of the abscess and appendectomy were done while in the remaining 16 patients drainage of the abscess alone was performed. Patients discharged from the hospital after having had an abscess drained or having had no operation were directed to return for appendectomy in six to eight weeks. Coller and Potter mention the presence of edema of the external genitalia as evidence of a large pelvic abscess and suggest that when this finding is noted the presence of an abscess should be suspected. Most of the deaths occurred in children a matter which opens the question of the applicability of the plan of deferred operation for children. All of the children on whom the Ochsner treatment was carried out were sicker than the members of the adult group. They believe that the mortality in children is high because of late diagnosis, home treatment with purging and the fact that localization is less likely to occur because of the small and underdeveloped omentum also because of the fact that the young child tolerates infection less well and the body chemistry is less stable than that of adults which makes conservative treatment less efficient. They conclude that while the deferred operative treatment is less efficient in children than in adults any form of treatment is less efficient in children and they believe that delayed operation should be employed in children with general peritonitis. However under no circumstances do they defer operation in cases of appendicitis associated with pregnancy since the presence of the enlarged uterus prevents localization of the infection. They agree with other authors that in pregnancy operation should be performed on the suspicion of acute appendicitis. They emphasize the fact that deferred operative treatment is not medical treatment and that it implies that operation will be performed in the

future After three years' experience with deferred operative treatment they believe that it has definite advantages over other methods of treatment for cases of spreading peritonitis

Alton Ochsner (63) believes that it is a mistake to judge the extent of the pathological lesion by the duration of the attack and he urges that cases be considered individually rather than by any fixed rule He agrees with the majority of surgeons that even though the appendix has recently perforated (within a few hours) early operation to remove the focus of infection is desirable However, when protective adhesions have started to form he believes that operative interference is definitely contraindicated and that late cases should be dealt with conservatively When, however, a well-defined abscess develops, surgical drainage is required and at this time the appendix should not be removed unless the situation is such that its removal can be done easily and quickly

Seifert (73) believes the results of the present-day treatment of appendiceal abscess are not good He cites figures to show that the mortality from appendiceal abscess is increasing while the total operative mortality is decreasing The latter fact he believes is due to better treatment of the cases with general peritonitis He believes that the treatment of abscess is difficult and should always be done by an experienced surgeon He proposes the following plan if (1) the abscess is unquestionably localized, (2) the fever is moderate, (3) pain is slight, and (4) the general condition and bowel activity are good, the conservative treatment is to be used

However, if pain and fever persist in spite of conservative management for two or three days, the patient is operated upon without any attempt being made to remove the appendix, care being used to protect the free peritoneal cavity from contamination

Suermondt (82) records his experiences in the Leiden Clinic during the past twenty-five years He believes that in acute appendicitis without extension to adjacent structures and in acute appendicitis associated with diffuse peritonitis the appendix should be removed at once On the contrary, in cases where there is extension of the infection beyond the confines of the appendix and in abscesses, the treatment should be conservative In such cases the body has already walled off the infectious process from the remainder of the peritoneal cavity Hence, if early appendectomy is performed important protective adhesions are broken down and the peritonitis may become generalized, and there is also the danger of the formation of fistulas Suermondt does not believe that

the forty-eight-hour rule is very useful, inasmuch as the stage of the disease can better be determined by clinical findings than by the time factor Under the usual conservative measures, if the inflammatory infiltration subsides by resorption, appendectomy is performed six weeks later If an abscess forms, operation is indicated only if it points upward or medially, thus showing an extension toward the free peritoneal cavity Extension downward does not constitute an indication for operation Spontaneous rupture into the rectum, vagina, or bladder is not regarded as serious If upward and medial extension indicates operation, simple drainage should be employed and a search for the appendix never made The author is convinced that the expectant treatment of appendicitic abscesses and infiltrations will yield better results than immediate appendectomy Under the conservative plan above outlined he had only 3 deaths in 407 cases, a mortality of 0.7 per cent In 256 of these cases in which expectant treatment only was employed there were no deaths In the remaining 151 cases in which an abscess was drained there were 2 deaths In 405 cases having secondary appendectomy there was 1 death, or a mortality of 0.3 per cent The author contrasts these figures with those reported by other authors (Abel, 4.05 per cent, Rieder, 7 per cent, Stich, 5.1 per cent) who have employed immediate operation

Mont Reid (68) warns against misinterpretation of the use of conservative treatment He fears that the total mortality of acute appendicitis may actually be increased unless the entire medical profession learns the clear indications for the conservative therapy and that it has no place in the acute unruptured case He states that he often experiences difficulty in deciding which cases should be treated conservatively Before the onset of abdominal distention, in cases of general peritonitis, he prefers to remove the appendix through a small McBurney incision, with or without drainage In well walled-off abscesses, he believes that it is good surgical judgment to observe the clinical course of the disease for a time before a decision for or against surgical intervention is made

Orr (64) emphasizes the fact that a patient with a ruptured appendix and an inflammatory mass at the site of the appendix is best treated conservatively because of the fact that prompt operation will not enable the surgeon completely to eradicate the infected tissues as is the case in the early stages of the disease He points out that many of these inflammatory masses will subside completely under conservative treatment and appendectomy

can be performed at a later date. If on the other hand under conservative treatment the mass increases in size and definite evidence of abscess formation is present then surgical drainage should be performed and this should be done extraperitoneally if possible. Ordinarily, at the time of the drainage of the abscess, appendectomy is not wise.

Lehman and Parker (46) record their experiences at the University of Virginia Hospital with the conservative treatment of appendix abscesses. A careful comparison is made with similar cases treated by prompt operation in earlier years in this same clinic and the results from conservative treatment are shown to be much superior. In their most recent series of abscess cases 83.3 per cent were treated along conservative lines and 65 per cent were carried through without operation. By the term abscess they include both inflammatory masses and definite suppuration. The mere fact that a localized abscess is present does not constitute an indication for surgery.

It was found necessary to abandon conservative treatment either early or late in certain cases and these were classified as forced operations. Thus surgical intervention became mandatory in cases complicated by acute intestinal obstruction or impending perforation of the abscess into the rectum or through the abdominal wall. The authors report no deaths in the cases treated without operation and in contrast to this a mortality of 4 per cent in cases treated by immediate elective operation and of 20 per cent in a small group of cases treated by late elective operation.

Furthermore patients treated by early elective operation suffered over twice as many complications as those treated conservatively throughout and those who had late forced operations. They also remained in the hospital one third again as many days and were febrile for a period about 25 per cent longer.

Patients successfully treated by conservative means are urged to report for interval appendectomy in from six weeks to three months. The authors state that the absence of complications, the short hospital stay, the brief period of pyrexia and the absence of any period of drainage are of considerable significance and conclude that successful conservative treatment is the most desirable method of treating this group of cases not only from the point of view of the prospect for recovery but also from the point of view of severity of the patients' illness and cost of hospitalization to add nothing of the pain, odor, nuisance and expense associated with a drained abscess.

While they do not discuss in detail the management of cases of general peritonitis they merely

mention that they prefer the conservative treatment for this type of case.

Pattison (65) in reviewing the question of the treatment of diffuse peritonitis states that as the result of his study of a group of patients and reported series in the literature he has been unable to conclude that either the conservative method or that of prompt operation is so satisfactory that it can be employed to the total disregard of the other. He believes that in cases of diffuse peritonitis the patient must be individualized. However even in cases of general peritonitis he rather favors early operation as long as the patient's general condition is good, his reason for this being the removal of the focus of infection. On the other hand in early cases of abscess that is in patients with abscess whose symptoms have been present for less than seventy-two hours he believes conservative treatment is important in order that adequate walling off of the infection may take place. He calls attention to the fact that in cases of acute appendicitis complicated by diabetes mellitus the mortality is high.

Miller and Turner (58) discuss the surgical management of appendicitis in children. They agree upon immediate operation in all cases before perforation. They find that the mortality in such cases is practically nil. If it is thought that the process is subsiding operation may be postponed. In the group of cases showing localized inflammatory masses at the time that the patient is first seen that is cases of perforation in which there has been set up from the start an adequate defense mechanism conservative treatment is favored. These so-called abscesses may vary considerably in size and location and often are detected only by rectal or bimanual examination. Following this conservative treatment during the attack the patients are routinely advised to return in three or four months for appendectomy. An increase in the size or spread of the abscess is occasionally noted. The abscess may point anteriorly, laterally or deep in the pelvis. If such is the case they may be drained through a small incision in fact with an extraperitoneal approach. In patients with perforation and lacking an adequate defense mechanism there is usually found the obstructive type of appendicitis with a perforation of considerable size and frequently the streptococcus is the predominant organism. The process then becomes generalized rather than localized and the clinical findings suggest a rapidly spreading peritonitis. The authors admit that there is considerable controversy as to the best form of treatment for these cases. They however recommend surgical removal of the source of infection combined

with adequate drainage when drainage seems necessary. In these cases the resistance of the peritoneum becomes decreased in proportion to the degree to which the blood supply of the bowel is disturbed by gaseous distention. The authors find the use of the duodenal tube, cecostomy, or appendicostomy of distinct value. They agree that it is impossible to drain the general peritoneal cavity adequately, but nevertheless they believe that local drainage seems to be of value. In this group of cases they report on 163 patients so treated with a mortality of 22.7 per cent.

Deaver and Martin (21), in reporting the results of their study of a group of 235 consecutive cases of acute appendicitis in children under fourteen years of age, state that in their series most of the patients were operated upon immediately after admission. In a few cases, operation was delayed. The delayed cases, however, were those of children who were extremely ill because of far-advanced peritonitis. For these cases the Ochsner-Deaver treatment was instituted. If an improvement was noted in twelve hours, conservative treatment was continued, whereas if improvement did not take place, operation was then performed. They state that by postponing operation in these cases, they feel certain that some patients who could not have survived immediate operation were saved. They agree with most other writers that the cases in which delayed operation is indicated in children are relatively few. They believe that Sir James Barrie has injured the reputation of a useful method of treatment by advising delayed operation in late cases of acute appendicitis without discrimination. On the other hand, in the cases with localized abscess, Deaver and Martin state that there is no need for urgency and that the patients respond better if the operation is delayed for a few days and conservative treatment employed during this period. However, they do not continue conservative treatment for a long period of time, but rather advise surgical drainage of the abscess when its presence is once established.

Herman Taylor (85), in a discussion of appendicitis in the aged, points out that if the process has already localized into a palpable abscess when the patient is first seen, conservative treatment is best. However, in the earlier cases, i.e., those seen before the third day, there is an even chance that the patient will develop diffuse peritonitis. Therefore, in such cases prompt operation is urged. Taylor believes it important to use a small muscle-splitting incision, and usually merely places a drain down to the appendix.

Bunch and Doughty (12) state that they believe that the question of when to operate is just

as important as the question of how to operate. In cases of perforation with diffuse peritonitis they advise postponement of the operation until the patient's resistance is increased and localization has occurred. In cases of abscess they advise surgical drainage in an extraperitoneal manner, if possible, also, if possible, removal of the appendix at the time of operation.

Nassau (59) states that there is a small group of patients in whom delay in operation is the wiser and safer course of procedure. In such cases the Ochsner treatment will allow localization of the infection to take place and the resulting abscess can be safely drained at a time when the patient's condition has been improved.

Stein (80), in his discussion of a paper by Chester L. Davidson, states that whenever he has been encouraged to delay surgery in a case of peritonitis associated with abdominal distention, high fever, and leucocytosis he has rarely been disappointed in the results obtained. Delaying operation in such cases until the patient has had an opportunity to localize the infection has always given favorable results. While Stein has seen patients with peritonitis operated upon promptly, and was subsequently convinced they would have done better with delayed operation, on the contrary, he has never seen a patient treated expectantly who he thought would have done better by prompt operation. He believes that this method should receive much more extensive consideration than it has in the past.

Young (92) of South Carolina, in a clinical study of 2,288 cases of appendicitis, reported 388 ruptured cases. Of these 55 were treated conservatively and 49 developed localized abscesses, with 1 death, a mortality rate of 2 per cent. The remaining 6 patients died of general peritonitis without being operated upon, giving a mortality of 12.6 per cent for the cases treated by conservative measures.

Bower (7), in commenting on the lowering of the death rate from acute appendicitis in Philadelphia as the result of public education, noted that surgeons had fewer cases of spreading peritonitis, and that the mortality in these cases was lower because surgeons were becoming peritonitis-conscious and were approaching the fulminating cases more deliberately.

A. C. Taylor and E. R. Schmidt (84) state that prior to 1928 nearly 100 per cent of their cases of acute appendicitis (in all stages) were treated by operative procedures. Becoming convinced of the value of conservative measures in certain cases, operation was performed in only 75 per cent of their cases from 1930 to 1934.

Gile and Bowler (26) from a study of 901 cases of acute appendicitis complicated by rupture conclude that an appendiceal abscess is a localized process and does not call for urgent measures.

In their discussions of various aspects of acute appendicitis the following authors make favorable reference to conservative treatment for certain types of cases: Kolodny (44) Holcomb (34) McDonald (57) Davis (20), and Reschke (69).

While much has been written during the past five years concerning the expectant treatment of the ruptured appendix this method has by no means been generally accepted by surgeons. During this same five year period many papers have likewise appeared either condemning the method or expressing frank skepticism as to its superiority over other methods. Other authors have reported their results in large series of cases which were treated by prompt operation. They suggest that these results are satisfactory or that they compare favorably with the results obtained by deferred operation. They frequently emphasize some particular point in technique or certain details of the postoperative care. Among the most emphatic objectors to deferred operation is Kennedy (40) who in his discussion of the reaction of the peritoneum as it affects the surgical pathology of peritonitis violently attacks conservative forms of treatment. Such treatment he states aims solely at the prevention of absorption of toxins by the peritoneum. He contends that it is not the peritonitis which will give the final and fatal dose of infection but rather the complications of the peritonitis which demand the most careful consideration. In other words he operates for the complications of peritonitis and not the peritonitis itself. He does not endorse the use of the Fowler position and in general peritonitis regards the peritoneal cavity as a huge carbuncle with numerous pockets or abscesses. He believes that the treatment of peritonitis is evacuation of the abdominal cavity in order that adhesions are separated abscess cavities are thus broken down and partial bowel obstructions are released. The operation is then completed by very free drainage of the peritoneal cavity by means of a coffee-dam of gauze. He concludes by saying that the physiological surgeon's practice of adding more days of delay in the case of the patient who already is too late is a most disastrous way of teaching the general profession earlier work.

Trinca (86) of Australia advocates immediate operation in the early cases even though signs of general peritonitis are present. If the process seems to be subsiding he believes one may allow it to subside before operating but even in the

cases he believes that immediate operation is best. With regard to cases seen after forty-eight hours presenting a localized peritonitis or an abscess he mentions the common belief that operation is especially dangerous from the third to the fifth days. He states in refutation of this idea that

the gentle surgeon will not have trouble in this dangerous period. In late cases with unmistakable evidence of general peritonitis the mortality is high. Since statistics show that with the Ochsner-Sherren method of treatment there is a lowering of the death rate he believes that the lesson to be learned here is that one can safely defer operation long enough to improve the patient's general condition with fluids and glucose prior to operation. However he prefers to operate while the peritonitis is still general and does not wait for the doubtful localization into abscesses. He likewise believes in immediate operation if a purge has been given. If an abscess has already formed it should be drained and the appendix left alone if it cannot be removed easily. Most appendix abscesses should be drained. If the appendix is not removed at this time it should be done later although not too soon. In the peritonitis case if it is possible to remove the appendix completely he favors no drainage and makes no attempt to remove free fluid from the abdominal cavity unless it is contaminated with fecal material.

In an excellent discussion of peritonitis in its more general aspects, Horsley (15) considers the topic of appendicitic peritonitis in some detail. He compares the ruptured appendix to a perforated peptic ulcer believing that in both cases bacteria continue to be admitted into the peritoneal cavity until the opening in the viscus is closed. In order to stop or prevent this constant reinfusion of the peritoneum he believes that operation should be performed in every case of acute appendicitis as soon as the diagnosis is made at whatever stage the disease may be. At the time of operation removal of the appendix is considered to be of paramount importance. He stresses the importance of the McBurney incision as he believes that a long abdominal incision with extensive sponging and rough handling of the tissues in peritonitis cases is probably more dangerous than leaving the case alone and trusting to nature to wall off the infection and allow an abscess to form. In his group of 727 cases of appendicitis treated according to the principles there was 1 death in 60 cases of abscess or a mortality of 1.67 per cent and 1 death in 9 cases of spreading generalized peritonitis or a mortality of 1.11 per cent.

Nuttall (60) states that while it is generally agreed that immediate operation should be done

in the early cases without perforation, the advisability of operation in cases seen after forty-eight hours, with or without a palpable mass, is disputed. It is said that surgical interference is particularly dangerous in the third, fourth, and fifth days, that during this period the natural immunity to infection is exhausted, and acquired immunity has not yet been established, the patient being in a negative phase. The author believes that there is no pathological evidence of a negative phase and that there is no justification for the assumption that delayed operation is best for cases of acute appendicitis seen two or three days after the onset. He calls attention to the disadvantages of expectant treatment and illustrates them by examples.

Kogon (43) believes that expectant forms of treatment are injudicious because of the fact that an exact diagnosis of the pathological changes in the appendix is often impossible, and the fact that the degree of the pathologico-anatomical lesion does not always correspond with the clinical findings. He believes that the hesitation of surgeons to operate in the presence of inflammatory infiltrations is not justified or warranted by clinical experience. On the contrary, he regards an infiltration or a resistance in the ileocecal region as an indication for operation, since these findings are indicative of severe destructive appendiceal changes. Furthermore, he contends that a recession of the clinical signs and symptoms during the first three days or later does not indicate that the further course of the disease will be favorable and therefore should not contraindicate operation. Also, operation in the quiescent or interval stage does not assure an uneventful postoperative course. Even in the presence of infiltrations which regress and become smaller under expectant treatment there is always the danger of exacerbation of a quiescent infection. He therefore concludes that emergency appendectomy in all stages of acute appendicitis appears to be the most rational method of treating this disease.

Herrick (31), in a discussion of the treatment and mortality of acute appendicitis with peritonitis, records his experience in this type of case. In a total of 217 cases of acute appendicitis with peritonitis there were 5 deaths, a mortality of 1.84 per cent. He believes that most important of all is immediate operation in every case, once the diagnosis is made. He believes that no possible excuse of holiday, professional or social, or other engagements should be permitted to break this rule. In spite of Ochsner's teaching, he believes that operation should be done at once on diagnosis. He believes that there has been suffi-

cient delay before the patient is seen by a competent surgeon and queries why treatment should be still further delayed. At the time of operation exploration is never attempted and in practically every case the appendix is removed at the time of operation. With regard to drainage, he asks "what is gained by closure of the abdomen based purely upon unsubstantiated theories of peritoneal resistance except a risk?" He believes that until the temperature has become normal and the patient is out of danger all drains should be left in place, but that they may be loosened or shortened from time to time.

C. R. Davis (18), in a critical analysis of 35 deaths in a personal series of 1,130 cases of appendicitis, attempts to learn if any of these deaths might have been avoided by a plan of treatment different from the one used. Prompt operation was performed. From the available literature on the subject the author is not convinced that delayed operation has any important advantages over immediate operation. He comments on the differences of opinion among various surgeons as to the indications for deferring operation. Thus some advocate deferred operation in cases of beginning spreading peritonitis, and others in the more advanced cases of generalized peritonitis. Likewise with regard to age, while many do not delay operation in children or in elderly patients, few authors are specific in their statements as to what constitutes the age limits. Davis concludes that were he afforded a second opportunity to care for these 35 fatal cases, he might have reduced his mortality by 1 per cent. Assuming the correctness of this conclusion, he doubts the wisdom of discussions concerning delayed operations, particularly inasmuch as at the present time definite and specific instructions cannot be given so that all can follow the same procedure intelligently. He believes that at the present time more progress can be made by more accurate diagnosis, more skillful surgery, and earlier operation in all cases. If delayed operation is to be practiced it should only be in the fulminating cases.

Boyce and McFettridge (9) believe that conservative treatment is rarely indicated in appendicitis at the extremes of life. They mention the fact noted by Eliason that the clinical diagnosis may be incorrect and that the appendix is actually unruptured in some cases when perforation is believed to have taken place. In such cases a deferred operation is objectionable. They believe that it is not the peritonitis itself which is the fatal factor but rather the toxemia which accompanies the peritonitis. They insist that when expectant treatment is to be employed the patient

should always be in a hospital. They condemn the institution of expectant treatment merely on the basis of the number of hours which have elapsed since the beginning of the attack. Furthermore they assert that a history of purgation should not be taken to be an indication for expectant treatment. They also state that expectant treatment should not be persisted in despite a rising pulse or persistence of pain or vomiting or in the face of any other signs or symptoms that indicate spreading of the infection. They agree heartily with Ochsner's original statement that if the expectant treatment is employed absolutely nothing should be given by mouth. They believe that the development of an abscess is the most favorable outcome of a ruptured appendix. When localization is definitely occurring a delayed operation is thought to be best. If operation is performed too early in such cases especially when removal of the appendix is undertaken adhesions may be broken down and the infection may spread to the general peritoneal cavity. If on the other hand localization does not appear to be taking place after rupture immediate surgery is indicated.

Maes, Boyce and McFetridge (54) in their study of 910 cases of acute appendicitis between the extremes of life (thirteen to thirty-nine years inclusive) found a total mortality of 4.6 per cent. When patients were seen during the first twenty-four hours of the disease the mortality was only 2.7 per cent whereas when they were seen after twenty-four hours the mortality was 6.5 per cent. The authors believe therefore that the time factor calls for consideration in delayed operations. In their series operation was delayed in 50 cases for from twenty-four hours to twenty-one days. Twenty-four of these patients were really never very sick. In only 4 of the remaining 26 did localization take place and 7 of the 26 died a mortality of 27 per cent or 14 per cent for the whole group. They conclude that certain cases which are seen late and in which localization has definitely occurred or is occurring can be handled satisfactorily by conservative measures. They believe however that any patient seen early and most patients seen late should not be so treated. In concluding they state that the only conservative treatment of appendicitis is radical. They likewise emphasize the value of cecostomy which is most effective when done at the time of operation.

Maes and McFetridge (55) in a consideration of acute appendicitis at the extremes of life point out the higher death rate in children and in patients past middle age. In discussing cathartics and purges they regard the ingestion of a purge

as an indication for operation whereas cessation of pain after taking a cathartic constitutes the last call to operate. They further state that the case for expectant treatment in appendicitis is not yet settled but very occasionally should it enter the discussion of appendicitis at the extremes of life. Even in middle life they adopt expectant treatment with many misgivings and feel that in children and old persons it has no place. Their chief reason against delayed treatment is that the peritonitis is not the most important complication of appendicitis but rather the toxemia.

Bauer (3) states that it is difficult to evaluate comparative statistics because of the lack of definite criteria as to the presence of peritonitis, the differences in terminology regarding the type of peritonitis and the difficulty of determining the circumscription, extent and severity of the process. He uses the terms circumscribed and non-circumscribed peritonitis. In his cases of non-circumscribed peritonitis there were wide fluctuations in the mortality curve from year to year. The mortality increased with the duration of the disease before operation; it was greater in males than in females and higher in childhood than in old age.

The mortality of circumscribed peritonitis showed similar fluctuations. Cases in which the appendix was directed medially or upward were responsible for the greatest number of deaths. The two disputed questions in the cases of non-circumscribed peritonitis are the advisability of immediate operation after forty-eight hours and the wisdom of drainage of the peritoneal cavity. The author maintains that operation should be done in every case irrespective of the duration of the condition as long as the patient is not moribund. He also contends that the abdomen should be closed without drainage in all cases of non-circumscribed peritonitis. In cases in which the bed of the appendix is necrotic or a persistent oozing occurs local drainage of the dangerous area is advisable but this does not mean any attempt to drain the free peritoneal cavity. He states that circumscribed peritonitis lends itself less favorably to any single plan of management. In cases of not more than five days' duration the results have proved that the mortality is lowered when operation including the removal of the appendix is performed immediately. This is true whether a palpable mass is present or not. The author's mortality for this type of case with this treatment was 6 per cent. In cases of abscess of more than five days' duration conservative treatment is thought to be safer but in the majority surgery will become necessary later.

Gray and MacKenzie (27), in reporting the experiences at the Mayo Clinic in the treatment of acute appendicitis, found a relatively high mortality in patients with diffuse peritonitis who were treated primarily by the usual conservative methods. Thus in 27 such cases, there were 9 deaths, a mortality of 33.3 per cent. In explanation of these figures, it is to be noted that 7 patients were never operated upon because their condition was too critical at all times to justify such a procedure. Of the patients in this group who ultimately came to operation, the mortality was only 10 per cent. In contrast to this, the mortality was 14.5 per cent in a group of patients operated upon primarily in the presence of diffuse peritonitis. The authors believe that one should adopt no dogmatic plan of management but that individualized treatment should be given according to the condition of the patient. They emphasize the fact that experience and judgment are essential in the care of such patients, and believe that at the present time it is impossible to formulate any dogmatic policy for treatment.

Schullinger (72) reports the results of his study of the cases of acute appendicitis seen at the Presbyterian Hospital in New York over an eighteen-year period. In acute appendicitis the mortality was 0.59 per cent. In acute appendicitis with local peritonitis the mortality was 1.0 per cent. In acute appendicitis with acute spreading diffuse peritonitis the mortality was 17.02 per cent and in acute appendicitis with progressive fibrinous purulent peritonitis the mortality was 88 per cent. He notes that the mortality in the first two groups is falling while in the latter two groups of cases it shows an alarming increase. A second factor to be considered in the decrease of the mortality is the type of anesthesia to be used. Schullinger apparently operated promptly on all cases but mentions that in any case in which difficulty is encountered in removal of the appendix the attempt at removal should be abandoned and simple drainage done. In the case of a peritoneal abscess, drainage with the least possible trauma and in the quickest and simplest manner is the procedure of choice. In the cases of general peritonitis, careful attention to the postoperative management is regarded as highly important.

Lewin (48) in his clinical study of acute appendicitis in old age states that "the treatment of these cases is always operative." When indicated he believes that the peritoneal cavity should be drained adequately. If removal of the appendix proves to be difficult or unwise at the time of operation, because of the patient's general condition, drainage only should be done.

Leonard and Derow (47) discuss the mortality factors in acute appendicitis as noted in a study of 1,000 cases operated upon at the Newton Massachusetts Hospital, between 1923 and 1933. In their series there were 47 deaths with a mortality of 4.7 per cent. Of the patients over fifty years of age, 50 per cent had general peritonitis or abscess. Eighty-four per cent of the patients were operated upon within ten hours after the onset of symptoms and in this group there were no deaths. The authors conclude that the mortality in the average case of acute appendicitis is not due to a single factor but to a combination of factors.

Lamon (45) reports his experience in 206 cases of acute appendicitis, all of which required drainage. These patients living in the Rocky Mountain district had to travel a long distance to reach a hospital. This factor of delay, plus a long, rough ride, probably accounted for a fairly high percentage of perforation. He employed prompt operation in all cases, invariably using a right rectus incision. He always removed the appendix and provided free drainage. In 68 cases of local abscess his mortality was 1.16 per cent and in 54 cases of peritonitis it was 24.07 per cent. He feels that in spite of the adverse circumstances making early treatment impossible or difficult, these results compare favorably with those of other authors.

Kehl and Rentschler (39) report the results of their study of 126 cases of acute appendicitis complicated by peritonitis treated at the Reading, Pennsylvania Hospital, during a six-year period. In 18 cases with acute gangrenous or suppurative appendicitis with localized peritonitis, there were 2 deaths. There were 41 cases of acute appendicitis with abscess formation and 2 deaths in this group. There were 67 cases of acute appendicitis with spreading or general peritonitis and 12 deaths. Other than for a moderate period of pre-operative preparation, none of the patients was treated by the expectant method. In all of the peritonitis cases, free drainage of the abdominal cavity was employed. The appendix was removed in practically every case. These authors believe that drainage of the peritoneal cavity under such circumstances is wise and that postoperative care is especially important in cases of peritonitis.

Cayford (13) reviews 614 cases of acute appendicitis with a mortality of 3.42 per cent. His discussion is concerned largely with the matter of drainage. He apparently practices early operation in all cases. In 265 cases of spreading or diffuse peritonitis his mortality was 9.01 per cent when drainage was employed, and only 3.24 per cent when drainage was omitted. In 21 of 75

should always be in a hospital. They condemn the institution of expectant treatment merely on the basis of the number of hours which have elapsed since the beginning of the attack. Furthermore they assert that a history of purgation should not be taken to be an indication for expectant treatment. They also state that expectant treatment should not be persisted in despite a rising pulse or persistence of pain or vomiting or in the face of any other signs or symptoms that indicate spreading of the infection. They agree heartily with Ochsner's original statement that if the expectant treatment is employed absolutely nothing should be given by mouth. They believe that the development of an abscess is the most favorable outcome of a ruptured appendix. When localization is definitely occurring a delayed operation is thought to be best. If operation is performed too early in such cases especially when removal of the appendix is under taken adhesions may be broken down and the infection may spread to the general peritoneal cavity. If on the other hand localization does not appear to be taking place after rupture, immediate surgery is indicated.

Maes, Boyce and McFettridge (54) in their study of 910 cases of acute appendicitis between the extremes of life (thirteen to thirty nine years inclusive) found a total mortality of 4.6 per cent. When patients were seen during the first twenty-four hours of the disease, the mortality was only 2.7 per cent whereas when they were seen after twenty-four hours the mortality was 6.5 per cent. The authors believe therefore that the time factor calls for consideration in delayed operations. In their series operation was delayed in 50 cases for from twenty-four hours to twenty-one days. Twenty-four of these patients were really never very sick. In only 4 of the remaining 6 did localization take place and 7 of the 26 died a mortality of 27 per cent or 14 per cent for the whole group. They conclude that certain cases which are seen late and in which localization has definitely occurred or is occurring can be handled satisfactorily by conservative measures. They believe however that any patient seen early and most patients seen late should not be so treated. In concluding, they state that the only conservative treatment of appendicitis is radical. They likewise emphasize the value of cecostomy which is most effective when done at the time of operation.

Maes and McFettridge (55) in a consideration of acute appendicitis at the extremes of life point out the higher death rate in children and in patients past middle age. In discussing cathartics and purges they regard the ingestion of a purge

as an indication for operation whereas cessation of pain after taking a cathartic constitutes the last call to operate. They further state that the case for expectant treatment in appendicitis is not yet settled but very occasionally should it enter the discussion of appendicitis at the extremes of life. Even in middle life they adopt expectant treatment with many misgivings and feel that in children and old persons it has no place. Their chief reason against delayed treatment is that the peritonitis is not the most important complication of appendicitis but rather the toxemia.

Bauer (3) states that it is difficult to evaluate comparative statistics because of the lack of definite criteria as to the presence of peritonitis, the differences in terminology regarding the type of peritonitis and the difficulty of determining the circumscription, extent and severity of the process. He uses the terms circumscribed and non circumscribed peritonitis. In his cases of non circumscribed peritonitis there were wide fluctuations in the mortality curve from year to year. The mortality increased with the duration of the disease before operation, it was greater in males than in females and higher in childhood than in old age.

The mortality of circumscribed peritonitis showed similar fluctuations. Cases in which the appendix was directed medially or upward were responsible for the greatest number of deaths. The two disputed questions in the cases of non circumscribed peritonitis are the advisability of immediate operation after forty-eight hours and the wisdom of drainage of the peritoneal cavity. The author maintains that operation should be done in every case irrespective of the duration of the condition as long as the patient is not moribund. He also contends that the abdomen should be closed without drainage in all cases of non circumscribed peritonitis. In cases in which the bed of the appendix is necrotic or a persistent oozing occurs local drainage of the dangerous area is advisable but this does not mean any attempt to drain the free peritoneal cavity. He states that circumscribed peritonitis lends itself less favorably to any single plan of management. In cases of not more than five days duration the results have proved that the mortality is lowered when operation including the removal of the appendix is performed immediately. This is true whether a palpable mass is present or not. The author's mortality for this type of case with this treatment was 6 per cent. In cases of an abscess of more than five days duration conservative treatment is thought to be safer but in the majority surgery will become necessary later.

Jones (37) reports his results in the treatment of 75 cases of diffuse general peritonitis due to acute appendicitis with perforation, with the low mortality of 14 per cent. He attributes his good results to the fact that operation was performed promptly, the appendix being removed, and appendicostomy being performed by the introduction of a small rubber tube into the cecum through the stump of the appendix. In some of the cases the wound was closed tightly about the tube, and in others drainage was employed.

Handley (30) stresses the importance of ileus as a cause of death in cases of appendicitic peritonitis. He states that peritonitis is rarely general even at the time of death. Beginning in the pelvis it gradually spreads upward to the hypogastric region. During this upward spread the stomach, jejunum, and transverse colon remain uninfluenced and unparalyzed until the patient is moribund. Hence, when distention of the hypogastrium is noted, prompt intervention is demanded. The author makes an anastomosis between a distended coil of jejunum and the transverse colon and performs a complementary cecostomy. A reflux flow of intestinal contents then occurs from the transverse colon along the ascends to the cecostomy. Within twenty-four hours there is a free flow and the abdomen becomes flat.

Shipley (76) in discussing deaths from peritonitis refers to drainage as a "necessary evil," and shows how in the course of his experience the number of cases drained has gradually diminished. In cases with early diffuse peritonitis (pus present in the peritoneal cavity, chiefly in the neighborhood of the appendix, but tending to collect in the pelvis and subhepatic region, the gut bathed in pus but still smooth, and no adhesions present, and the patient presenting the clinical picture of acute appendicitis but with little evidence of peritonitis) he urges prompt operation with removal of the appendix and no drainage. In the late neglected cases with a palpable mass, drainage (with appendectomy if possible) is advised, and the rest of the peritoneal cavity is to be disturbed as little as possible. In his article he states the differences of opinion of various authors regarding early and late operations, but takes no definite stand. He gives the impression of favoring prompt operation, however.

Gile and Bowler (26) distinguish between early peritonitis and diffuse peritonitis. In the former, they advise early operation since it may prevent the latter, which has a much higher mortality.

Hertzler (32), in a discussion of different types of appendicitis and the type of peritonitis associated with them, states that it is the necrotic ap-

pendicitis and the gangrenous appendicitis which are responsible for spreading or diffuse peritonitis. He advises prompt operation with appendectomy for removal of the cause of the trouble and urges the surgeon to drain "wisely."

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cases of local abscess tight closure was practiced with no fatalities. The remainder of the 75 cases were drained with 1 death. Cayford notes in his conclusions that there is a definite trend at the present time to drain less frequently and calls attention to the fact that if drainage can be safely omitted the hospital stay is definitely shortened. With regard to the indication for drainage or non drainage he believes each case to be an individual problem and that there can be no standardization for the procedure. In general if the peritonitis is advanced and the peritoneum is dark hemorrhagic and edematous and has thus become incapable of further absorption and elimination surgical evacuation of the exudate is required as well as adequate drainage. If however the patient's condition is satisfactory and he is showing good resistance to the infection the simple removal of the focus of infection with aspiration of the exudate at the time of operation followed by tight closure will suffice. Again the presence of considerable edematous necrotic material at the base of the appendix is an indication for drainage.

In discussing the management of general peritonitis Breitman (10) agrees with many other authors that the problem of drainage of the peritoneal cavity is unsettled. In his opinion treatment of peritonitis should include (1) removal of the source of infection (2) removal of infected exudate and prevention of its further formation (3) restoration of normal conditions of the circulation the last being best accomplished by complete closure of the abdominal wound.

He objects to attempts at removal of the exudate from the peritoneal cavity as it contains beneficent antibodies which are thus lost to the body. If, however the exudate is found to be very purulent and to contain necrotic tissue or intestinal matter it does more harm than good and should then be removed at the time of operation. He believes that if drainage is required it is best provided by insertion of the drains between the anterior abdominal wall and the omentum in such a way that they will not come in contact with the intestines.

Gamble (24) calls attention to the fact that in the case of a ruptured appendix anaerobic organisms are present and that while they may be overcome in the peritoneal cavity they may gain a foothold in the wound. This wound infection may be fatal. Therefore he proposes a method whereby the appendix is removed drains are placed and then the peritoneum is closed to the drain. The wound is packed this pack being removed twenty-four hours later in order that the wound may be exposed to the air. He believes that the adoption

of this method will lower the death rate from this type of peritonitis.

DeCourcy (2) notes that the mortality in acute appendicitis is still excessively high. He believes that it can be lowered by lay education regarding the importance and significance of abdominal pain and by improved technique in the handling of the ruptured cases. His paper is chiefly concerned with the latter phases of the problem. He apparently advises prompt operation in all cases and believes that deaths in cases of ruptured appendicitis are usually due to distention from intestinal obstruction rather than to the infection of the peritoneal cavity. He believes that decompressive cecostomy at the time of appendectomy will greatly lower the mortality.

Hoseman (36) discusses the management of severe peritonitis due to perforations in the gastrointestinal tract. In these cases he advocates early surgery to remove the focus of the infection. This is followed by aspiration of the pus and then the introduction of from 50 to 100 c cm of ether into the peritoneal cavity before it is closed and finally by a prophylactic appendicostomy. He reports a mortality of 11 per cent in this group of cases which he compares to the usually reported mortality of from 40 to 80 per cent in these severe types of peritonitis.

Shute Jr (77) reports his experiences in the treatment of perforated cases by employing immediate operation consisting of appendectomy and cecostomy. His mortality rate was 22.5 per cent in 40 cases of diffuse peritonitis, 15.00 per cent in 53 cases of localized peritonitis, 16.66 per cent in 24 cases of early abscess—a mortality of 17.04 per cent for the group. Employing the aforementioned procedure he noted that in cases of diffuse peritonitis in which drainage was employed the mortality was 24.2 per cent whereas in similar cases which were not drained the mortality was only 14.4 per cent. Likewise in cases of localized peritonitis the mortality was higher when drainage was employed being 17.1 per cent in the drained cases and 11.1 per cent in the undrained. On the contrary with early abscess the mortality was 10 per cent with drainage and 50 per cent when drainage was omitted. When the results were compared with a group of cases of rupture complicated by local peritonitis early abscess or well walled-off abscess in which immediate appendectomy without cecostomy was performed it was found that the mortality was slightly higher with cecostomy. Shute states that he has just started using the conservative method for diffuse peritonitis as he is convinced that one should not operate upon these cases at once.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Luccioni, F, and Thomas, N · Internal Strangulation Through the Greater Omentum (*L'étranglement interne a travers le grand épiploon*) *J de chir*, 1938, 53 337

According to the authors the literature contains only 35 reports of cases of herniation of the bowel through an orifice in an otherwise normal, normally-placed greater omentum. This rare anatomical defect is usually found singly, infrequently there are two or more rents in the membrane. The opening may be from 1 to several centimeters in diameter and its edges may be thin, as is the case after a fresh mechanical rupture, or they may be thickened and adherent to parietes or intestines if the defect is the site of a chronic inflammatory process. If the latter is the case, the orifice presents a setting especially adapted to the strangulation of a loop of small bowel. Because of its long mesentery, its peristaltic movement, its small size, and its freedom of movement in the abdominal cavity, the small bowel is almost invariably found to be strangulated in such an opening. Only 1 case of colonic strangulation has been reported.

Three types of "transepiploic" hernias may be distinguished: (1) the intestine passes through an orifice of the omentum already contained in the sac of an umbilical, inguinal, or femoral hernia, (2) the intestine gains access through an operative defect of the omentum, as after an anterior gastro-enterostomy, (3) the intestine passes through a thinned-out area of a normal omentum. Such strangulations may be caused by the increase of intra-abdominal pressure, as in defecation, micturition, and parturition.

The symptoms are those of a subacute mechanical intestinal obstruction, with gradually increasing pain, vomiting becoming fecal, distention, fluid collection in the flanks, and other common signs of ileus, together with an increase in the fever and pulse rate, and, finally, oliguria. Unless the diagnosis is made and surgical intervention is resorted to early, these patients usually die of generalized peritonitis following a gangrenous slough of the trapped coil of intestine. Unfortunately the diagnosis is frequently *not* made, and surgical relief arrives too late or not at all.

JOHN MARTIN, M D

GASTRO-INTESTINAL TRACT

Mitchell, G A G The Nerve Supply of the Gastro-Esophageal Junction *Brit J Surg*, 1938, 26 333

This study on the nerve supply of the gastro-esophageal junction explains why the results obtained either by sympathetic section or parasympathetic section in the human being have not only

been inconsistent, but often diametrically opposite to those theoretically anticipated. Mitchell demonstrated that the lower end of the esophagus has sympathetic innervation from (1) the gangliated trunks between the sixth and ninth or tenth thoracic ganglia, (2) the greater, and occasionally the lesser, thoracic splanchnic nerves, (3) the para-aortic nerve when present, and (4) the plexuses around the left gastric and inferior phrenic arteries. In addition he found that the thoracic, cardiac, pulmonary, aortic, and esophageal branches from the gangliated trunk were united by vertical filaments in practically linear series.

The para-sympathetic supply is derived entirely from the vagi. After the vagi divide into from two to four main branches lying in close relationship to the lower esophagus there are commonly found three on the right side and two on the left, *all interconnected by finer twigs so that a circumesophageal plexus results*. The right group of vagal fibers eventually lie on the posterior surface of the esophagus, and the left on the anterior surface, but one or two small branches from the right vagus join the anterior half and the left vagus contributes a branch or branches to the posterior half of the plexus. Immediately above the diaphragm or just within the esophageal hiatus the branches of the plexus reunite into one or two main trunks entering the abdomen.

The sympathetic supply to the upper end of the stomach is derived mainly from the celiac plexus, but a small number of sympathetic fibers may come from the esophageal plexus. In a few cases some filaments from the left greater splanchnic nerve or from the upper end of the left lumbar gangliated trunk go directly to the gastro-esophageal junction. Most of the sympathetic nerve fibers from the celiac plexus reach the cardia alongside of the left gastric, the inferior phrenic, and the hepatic arteries. The left gastric branches, varying from 1 to 4 in number, lie near the artery. The left inferior phrenic plexus gives off 1 or 2 branches directly to the cardiac orifice, one of which usually passes to the right and unites with a twig from the plexus accompanying the left gastric artery, or with a branch to the cardia from the hepatic plexus and forms a loop around the junction of the stomach and esophagus. The situation is still further complicated by the fact that other sympathetic pathways come from the hepatic plexus between the two layers of the lesser omentum and send filaments toward the cardiac orifice. *It is important to know that this nerve in most of its course is not near the left gastric artery, although it always comes into relationship with its esophageal branches*.

The parasympathetic supply of the upper end of the stomach consists largely of an anterior trunk which may be single or double and which divides near the proximal end of the lesser curvature into

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Of the benign tumors, 63 per cent were operated upon. The type of operation ranged from excision of the tumor to gastric resection. Of the leiomyosarcomas 85 per cent came to operation, which ranged from biopsy to gastric resection. Several patients were operated upon in two or more stages. There were 7 deaths among 105 patients operated upon for benign tumors and 20 deaths among 44 patients operated upon for malignancy. Among the unoperated cases, gastric hemorrhage was responsible for one-half of the deaths. In the remainder of the unoperated cases death resulted from anemia secondary to repeated small hemorrhages, cachexia, or suppuration of the necrotic mass.

Mere excision of the tumor gave as good end-results as extensive gastric resection, and carried a lower operative mortality. **CARL O. LATIMER, M.D.**

La Manna, S. Gastro-Intestinal Carcinoids (I carcinoidi gastro-intestinali). *Tumori*, 1938, 24, 381.

The histogenesis of gastro-intestinal carcinoids is still under discussion. The tumors are found most frequently in the jejunum and ileum, those of the ileum show a predilection for adults of the male sex and those of the appendix for the female sex. They may be numerous, and their size varies from that of a pinhead to that of a cherry, they are round or umbilicated, hard, and have a large base of attachment. One of their principal characteristics is the presence of argentochromophil granules in the cytoplasm of their cells, analogous to those found in the yellow cells of the intestine. Other cellular inclusions of carcinoids are droplets of neutral fat and birefractive crystals of lipid, and occasionally granules of glycogen. The stroma of the tumors is formed by a connective tissue, moderately rich in cells, which are for the most part fusiform, in addition there are lymphocytes, polymorphous leucocytes, plasma cells, and eventually muscular-fiber cells. The blood vessels may be scarce or abundant. Carcinoids are found at autopsy or at operation, in the latter case they are found usually in the appendix. They very seldom cause intestinal symptoms, grow slowly, and, when left undisturbed, may undergo malignant degeneration, however, they are usually benign and metastases are rare, as only about 30 cases have been reported.

La Manna describes the case of a woman aged sixty-seven years, in whom about 70 tumors, the size of a small nut, were found. Thirty-one of these, considered primary, were located near the mesenteric insertion, and infiltrated the three layers of the intestine, 28 were observed in the jejunum and ileum, and 3 in the cecum and colon. In some tumors of this group, the tunica propria was little infiltrated and some adenomatous branches issued singly from the bottom of individual crypts of Lieberkuhn, which gave the impression of a multicentric development of the tumor, the newly formed tubules perforated the muscularis mucosae and continued into the tumor above it. In other tumors of this group, there was no connection with the in-

testinal glands, and the tunica propria appeared to be intact. There were 40 metastatic nodules, larger than the primary lesions and located in the mesenteric insertion of the intestine, the epiploic appendices, and the mesentery. The histological morphology of the neoplastic tissue was that of a pure adenocarcinoid in all the nodules, excepting 2 in which was found a microscopic nodule formed of solid cellular cords. The outstanding characteristic of the tumoral cells was the presence of very fine argentophil and lipid granules. The interest of the case lies in the observation of primary nodules in the cecum and ascending colon, in which no form of carcinoid has as yet been reported, and in the decidedly adenomatous structure of the nodules.

RICHARD KEMEL, M.D.

Wise, R. A. The Miller-Abbott Double Lumen Tube in Intestinal Obstruction. A Preliminary Report. *Am J Surg*, 1938, 41, 412.

The treatment of intestinal obstruction, whether paralytic or mechanical, is often a difficult problem for the surgeon. Patients with obstruction of long standing who are seriously ill from dehydration and toxemia, will not stand exploration very well, while simple enterostomy frequently fails to alleviate the condition. Any new method which may aid in the treatment of these difficult cases should be welcome. Such a method is described, and the results obtained have been most striking.

The method involves the use of a double lumen rubber tube, like that first devised by Miller and Abbott. These men utilized the tube in a study of the secretion and absorption of the normal small bowel. Ravdin first suggested its use in the treatment and diagnosis of intestinal obstruction.

The Miller-Abbott tube is 10 ft. in length and 16 French in diameter. A rubber septum extends throughout its length, and makes a double lumen tube. The inflation tube opens into a soft rubber balloon, the suction tube has several openings at its distal end and terminates in a metal tip. When the tube has passed the pylorus and the balloon is inflated, it will be carried along by peristalsis through the entire length of the intestinal tract. As it traverses the intestinal tract, suction is applied to remove fluid and gas from each distended loop of bowel. With this tube it is possible to deflate the entire intestinal tract in patients with intestinal obstruction from whatever cause—mechanical or paralytic.

The author describes the technique of use of this tube, as follows:

The end of the tube is well lubricated with glycerin and is passed through the pharynx, by way of the nostril, into the stomach. A swallow of water is given to aid in the passage of the tube, which is introduced until the 75 cm. mark is reached. The patient is placed on his right side, and this position is maintained for from two to six hours, during which time the tip of the tube has usually passed through the pylorus and into the duodenum. This position

the hepatic pyloric and celiac branches which cross between the layers of the lesser omentum and then pass upward or downward to their destinations. This trunk also divides into a group of gastric branches some of which radiate to the cardiac orifice and across the fundus and to the upper part of the body of the stomach with one or two larger divisions present along the lesser curvature. The posterior vagal trunk or trunks also divide into two main sets of branches, the smaller group is distributed to the cardiac orifice and stomach somewhat similarly to the anterior group but the larger part of the nerve continues downward to the right near the left gastric artery and ultimately terminates in the celiac plexus.

The arrangement of the nerve supply to the gastro esophageal junction has become surgically important since Knight in 1935 suggested a method of sympathectomy for the relief of achalasia of the cardia and cardiospasm. His procedure consisting of excision of the left gastric artery with its surrounding fatty and nervous tissue has proved unsatisfactory except in a few cases. These failures can be readily explained because

1. The sympathetic nerve supply to the gastro esophageal junction in man comes from several sources which differ from case to case in relative importance and removal of the left gastric artery with its surrounding fatty and nervous tissues will not completely destroy the sympathetic nerve supply to the junction.

2. The nerve structures in relationship to the left gastric artery are entirely different within a comparatively circumscribed area near the cardia.

3. Widespread removal of the left gastric artery as suggested by Knight might produce the opposite effect to that intended namely, a complete or almost complete interruption of the parasympathetic supply and only subtotal sympathetic denervation may result. Thus the patient's condition might be aggravated rather than alleviated. Therefore the problem of how to best produce sympathetic denervation of the cardiac orifice while doing as little damage as possible to other nerve structures still remains. At once it may be said that any successful peripheral operation would of necessity be more radical than the procedure at present in vogue because the gastro esophageal junction receives nerve filaments from widely different sources which vary from case to case in relative size and importance. At present if any peripheral operation is considered it would probably be advisable to remove only the middle and proximal part of the left gastric artery together with the surrounding fatty and nervous tissues. This would avoid damage to the esophageal and gastric branches of the vagi and would prove as effective as the more radical operation in destroying the sympathetic filaments. It would also be advisable to remove part of the left inferior phrenic artery with its associated nerves and to divide any nerve filaments passing across to the cardia from the hepatic plexus high up between

the layers of the lesser omentum or an attempt could be made to interrupt the nerve fibers to the lower esophagus where they lie in the ganglionic trunk or rami. Removal of the ganglionic trunks between the sixth and ninth thoracic ganglion may interrupt the sympathetic nerve supply to the cardiac orifice. It is however impossible to be dogmatic for many of the efferent fibers might be conveyed in the greater splanchnic nerves which often have their roots of origin above the level of the sixth thoracic ganglion and there must be a limit to the extent of operative interference lest the remedy be more dangerous than the disease.

SAMUEL J. FORDISON, M.D.

Chaffin L. Smooth Muscle Tumors of the Stomach. *West J Surg Obst & Gynec* 1938 45: 13.

The author reviewed the literature on smooth muscle tumors of the stomach and found 363 cases of leiomyoma which amounted to approximately 7 per cent of all the cases reported. The remainder (93 per cent) were found to be leiomyosarcoma. To these he adds a case of leiomyosarcoma of his own. The distribution between the sexes was nearly equal, 57 per cent of the patients were female and 43 per cent were male. Malignancy occurred in 37 per cent of the males and in only 23 per cent of the females. The ages ranged from seven to ninety years with the greatest incidence occurring from the fourth to the seventh decade. Malignancy was more frequent in the lower age group.

The highest incidence of lesions was at the pylorus with a slightly lower incidence at the cardia of the stomach. Very few tumors of the fundus were found. The greater and lesser curvatures were involved about equally.

The most common complaints included a palpable abdominal mass, epigastric pain, vomiting of blood, tarry stools, persistent vomiting and indigestion. Many of the tumors found at autopsy were asymptomatic. The duration of the symptoms varied from a few days to forty years. In half of the cases the symptoms had existed for two years or less; in 3 per cent they had been present less than six months.

Physical examination usually yielded no definite diagnostic information except when a mass could be palpated. X-ray examination was of great aid but not without an appreciable degree of error. Of 55 smooth muscle tumors of the stomach studied roentgenologically, 56 per cent showed evidence of a gastric tumor, 11 per cent showed an extrinsic gastric lesion, and 27 per cent showed a peptic ulcer without a filling defect. Subserous tumors were the greatest source of error in the diagnosis of tumors outside of the stomach. The percentage of error by the roentgenologist has decreased in recent years.

The most common pre-operative diagnosis was carcinoma of the stomach (41 per cent) and non-malignant tumor (30 per cent). In the lesions diagnosed as extragastric, practically every abdominal and pelvic organ was involved; retroperitoneal tumors were also included.

cases), (7) insidious onset with slow progression, changing to a fulminating condition and ending fatally (52 cases), and (8) fulminating throughout, ending fatally (21 cases)

Of the 871 patients, 491 were male and 380 female. The age of 32 patients at the onset of the condition was from less than one year to nine years, of 151, from ten to nineteen years, of 316, from twenty to twenty-nine years, and of 372, from thirty to seventy-four years. Although the disease may begin at any time of the year, the number of patients whose symptoms began in January or February was 38 per cent above the expected number, whereas the incidence for June and October was 31 per cent below the expected.

The most frequent complications and sequelae were polyposis (141 cases), stricture (98 cases), perianal abscess or fistula (73 cases), arthritis (55 cases), and carcinoma (28 cases). Forty-two per cent of the males and 40 per cent of the females had complications.

Treatment includes the administration of anti-streptococcal serums and vaccines, a diet rich in calories, high in proteins, and low in residue, frequently a series of transfusions of small amounts of blood, removal of the foci of infection, good nursing, adequate rest of the bowel, and other symptomatic measures. In most cases, drugs are of little help. Surgical intervention should be limited to the complications and sequelae.

The end-results of this infection may be devastating but they may also be complete relief of all symptoms and signs of intestinal pathological change. The latter occur frequently enough to make it urgent that a well ordered regimen be followed without deviation by the patients for months and years.

Wood, F. G., and Wilkinson, M. C. Hyperplastic Tuberculosis of the Cecum. Roentgenological Diagnosis. *Lancet*, 1938, 235-560.

Six cases of hyperplastic tuberculosis of the cecum are described. The chief initial symptom in each case was diarrhea. Colicky pain was also a pronounced symptom, and there was progressive loss of weight and a slight fever. On examination, a slight tenderness was noted in the right iliac fossa, and a slightly movable tumor could be palpated. As the disease progressed a localized peritonitis developed, and in one patient the tumor became fixed in the midline below the umbilicus. Neighboring coils of small intestine became adherent to the mass and, finally, sinuses and fecal fistulas developed. The condition of the patient gradually became worse. No tuberculous lesions developed in other parts of the body in any of the patients.

The differential diagnosis is often difficult, both clinically and roentgenologically. The conditions which may cause a palpable tumor in the region of the cecum are carcinoma of the cecum, hyperplastic tuberculosis, and regional ileitis.

In the series of cases reported, the barium meal was used for roentgenographic examination. This

method has the advantages of outlining the cecum (the part of the bowel most often affected), and also the appendix, unless it is occluded by the presence of disease. Serial roentgenograms should be taken three hours after the ingestion of the meal and continued until the cecum and ascending colon are empty. The presence of the constant deformity can be confirmed by means of a barium enema. The appearance of the lesion on the roentgenogram is that of a tumor of the large bowel, but it is not always possible to distinguish roentgenologically between hyperplastic tuberculosis and neoplasm. The appendix was not filled in any of the authors' cases, and it appears probable that this feature may sometimes help in the differential diagnosis. When the appendix does fill, a neoplasm may be suspected.

The roentgenological appearance of regional ileitis may closely resemble hypertrophic tuberculosis if the cecum is affected, but the authors have not observed Kantor's string sign, nor has the obstruction been sufficient to produce multiple fluid levels in a roentgenogram of the abdomen without barium.

The authors conclude that it is often necessary to resort to laparotomy to establish the nature of a cecal lesion. Constitutional measures were successful in some of the reported cases of hyperplastic tuberculosis of the cecum. Nevertheless, surgical treatment should always be considered, and not be delayed until the later stages of the disease when fistulas have formed. JOHN H. GARLOCK, M.D.

Moore, T. Carcinoid Tumors of the Appendix. *Brit J Surg*, 1938, 26-303.

Most of the reported early cases of carcinoma of the appendix were undoubtedly examples of metastases which had spread by way of the celom from some primary intraperitoneal site. The early writers stressed the association of the disease with "obliterative appendicitis." They noted that these tumors did not infiltrate widely, nor give rise to metastases in the lymph glands. In 1907, Oberndorfer clarified the position. He showed that there occurred in the gastro-intestinal tract, in addition to the ordinary adenocarcinoma, a superficially related type of tumor, for which he coined the term "carcinoid." This tumor he believed was characterized by its localized nature and apparent benignity, by the absence of mesenteric spread through lymph and vascular channels, by the fact that it was often multiple, and by its distinctive histological appearance.

It is now well known that carcinoids may occur anywhere in the gastro-intestinal tract, from the cardia to the lower end of the rectum. They occur most commonly in the appendix, and they constitute approximately 0.4 per cent of appendicular lesions. They are the most common neoplasm occurring in the appendix. Reimann found 17 appendicular neoplasms in 13,151 appendices removed at operation. Fourteen of these were carcinoid tumors and 3 were adenocarcinomas.

A nodule of characteristic yellow color and of varying size is found in the mucosa. It is of firm rub-

may be determined accurately with the x rays and some indication of the position may be determined by the syringe test and by the character of the aspirated fluid. With the tube in the duodenum 30 cm of air are now injected into the balloon the balloon tube is clamped and constant Wangenstein suction is applied to the suction tube. Every six hours more of the tube is inserted until the 8 ft mark is reached. The suction tube is irrigated once every hour with 20 c cm of water.

Three cases of intestinal obstruction are reported.

CASE 1 A man of fifty four years was admitted to the Bellevue Hospital New York with a fracture of the upper third of the left femur. Two days after admission abdominal distention pain vomiting and paralytic ileus developed. This was not relieved by Wangenstein suction and other local measures. A flat plate of the abdomen revealed distended loops of the small bowel. The tube was passed through the duodenum the balloon inflated and constant Wangenstein suction applied to the suction half of the tube. At twenty four hours the tube end was far down in the ileum. The general condition was greatly improved and 1000 c cm of fecal fluid had drained through the suction tube. By the second day the tube tip had entered the cecum. The abdomen was soft and the patient was able to take cereal milk and broth by mouth. He also had a liquid bowel movement. Improvement continued and on the fifth day the tube was removed from the nostril. There was no recurrence of the distention and the patient had no further trouble.

CASE 2 A man of fifty eight years was admitted to the Knickerbocker Hospital New York. He had abdominal pains a slowly distending abdomen and persistent vomiting of bile stained fluids. The symptoms had been present for seven days. In spite of catharsis the bowels had not moved for one week. The patient was very obese. Physical examination revealed a markedly distended abdomen with a small umbilical hernia 4 cm in diameter. Conservative measures were instituted and enemas high colonic irrigations and a Levine tube with Wangenstein suction did not relieve the obstructive symptoms. He was given repeated infusions and vomited 1000 c cm of fecal fluid the second day. The Miller Abbott tube was introduced and within two hours had passed into the duodenum. Constant Wangenstein suction was applied to the suction tube. The first day the abdomen was softer and the patient was taking fluids by mouth with no vomiting. The drainage amounted to 3000 c cm of fecal fluid. A roentgenogram of the abdomen taken after 50 c cm of barium had been injected through the suction tube showed obstruction and a distended loop of small bowel proximal to it. The tip of the tube had passed into the left lower abdominal quadrant. The barium was sucked out of the tube immediately after the roentgenogram had been made. There was steady improvement throughout the next few days but the tube remained in the same relative position in the left lower quadrant. On the fifth and sixth

days the tube was clamped for twelve hours and the patient was taking a soft diet with no return of distention and with daily bowel movements. The tube was removed on the eighth day and the patient made a rapid uneventful recovery.

CASE 3 A young woman of thirty years was admitted to the New York Hospital on February 19, 1938, complaining of repeated attacks of abdominal pain nausea and vomiting. She had had 3 previous operations and an attack of postoperative ileus following the third operation which was relieved by jejunostomy. Since this patient was known to be subject to the formation of adhesions with intestinal obstruction it was decided that she now had a partial obstruction but the site could not be determined. The Miller Abbott tube was passed through the duodenum within two hours. After twenty four hours the tube was introduced to the 7 ft mark and a second roentgenogram was made. This revealed the tip of the tube to be stopped in the right lower quadrant while the barium advanced upward and then downward at a very acute angle. On February 24, 1938, exploratory laparotomy revealed a loop of ileum firmly adherent to the parietal peritoneum in the right lower quadrant. The bowel was sharply kinked which caused a partial obstruction. The kinked loop of ileum was carefully freed to overcome the obstruction. Convalescence was uneventful.

JOHN W. NUTZEL, M.D.

Bargen J. A. Jackman R. J. and Kerr J. G. Studies on the Life Histories of Patients with Chronic Ulcerative Colitis (Thrombo Ulcerative Colitis) with Some Suggestions for Treatment. *Ann Int Med* 1938 12 339.

This study is based on the records of 871 patients who presented typical clinical proctologic and roentgenological evidence of chronic ulcerative colitis of the streptococcal type. The most common predisposing factors and factors influencing relapses of the disease are upper respiratory infection diseases of childhood dietary indiscretion physical and mental fatigue rectal and abdominal surgical operations trauma drastic catharsis foci of infection with sepsis exposure dysentery epidemics and pregnancy. Of these upper respiratory infection is the most frequent.

The disease may begin (1) with passage of one or more bloody rectal discharges without other apparent symptoms (insidious 444 cases) (2) with sudden severe bloody dysentery but otherwise without symptoms of sepsis and toxemia (severe 204 cases) or (3) with violent bloody purulent dysentery with septic type of fever great toxemia and rapid depletion (fulminating 263 cases).

On the basis of its course the disease can be divided into the following types: (1) mild throughout (157 cases) (2) intermittent with declining severity (139 cases) (3) septic with complete recovery (44 cases) (4) constant without remission (69 cases) (5) slowly progressive without remission (143 cases) (6) intermittent with progressive severity (246

pelvis (this organ is surrounded with an area of dense inflammatory scar tissue by means of a sclerosing solution), repair and reinforcement of the anorectal sphincteric musculature, and, finally, perineorrhaphy in both males and females to supplement the first three procedures. In this series of patients, conservative measures sufficed either to completely correct the disturbance in the majority of the patients or to give sufficient relief to make the patient's life agreeable. The author has never had to carry out the operation of rectosigmoidectomy. However, this very radical operation has a definite place in dealing with the intractable type of prolapse.

JOHN W. NUZZUM, M D

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Gray, S H, Probstein, J G, and Heifetz, C J
Transient Acute Pancreatitis *Ann Surg*, 1938,
108 1029

Twenty-one cases which have finally been labeled transient acute pancreatitis are presented in detail.

The clinical signs and symptoms upon which this diagnosis is based are sudden severe upper abdominal pain radiating through to the back or to the shoulder, nausea and vomiting may or may not be present, and shock may be demonstrable. Examination usually reveals marked tenderness of the upper abdomen and rigidity of varying degrees. Early in the attack the temperature is usually normal, but it may be elevated later. The leucocyte count is usually high.

The blood and urinary diastase were determined by Somogyi's method. Normal blood diastase values ranged between 80 and 180. The rise of diastase in the blood was possibly due to a combination of factors, namely, inflammatory or spastic occlusion through the duct system and interstitial absorption of diastase. Liver and muscle tissue must also be considered as possible additional sources of circulating diastase. Following a rise in the blood diastase, there results in from two to five hours a corresponding rise in urinary diastase unless there is an impairment of the kidney function.

The sudden marked rise of blood diastase associated with acute pancreatic disease is highly significant. The authors believe that repeated normal blood-diastase determinations made early during an attack of acute upper abdominal pain exclude the pancreas from consideration. To use the diastase determinations one must be careful to make early and repeated examinations. With regard to the use of blood-diastase versus urine-diastase determinations, it would be preferable to use both. Normal blood diastase fluctuates less widely than normal urine diastase. Urine diastase varies between 200 and 800 and shows considerable irregular diurnal variations. Since the urine diastase follows fluctuations in the blood after a lapse of several hours, urine diastase determinations may furnish valuable information if they are made during the

subsidence of an attack. Thus urine diastase may remain elevated after the blood diastase returns to normal. There seems to be no constant relation between the severity of an attack and the level of a diastatic activity.

At least half of the authors' cases presented unmistakable signs of biliary-tract disease. Biliary-tract disease *per se* is not accompanied by an elevated blood diastase, on the contrary, *many cases of biliary-tract disease when associated with impaired liver function present subnormal blood-diastase values*. When a patient with biliary-tract disease suddenly develops an elevated blood diastase the presence of a pancreatic involvement should be suspected.

Many cases of acute pancreatitis occur without glycosuria. A blood-sugar determination may add weight to the diagnostic conclusions.

The first examination will most likely not distinguish between a pancreatitis of the transient type and one which will progress to necrosis with its accompanying high mortality. The authors are of the opinion that until more specific measures are forthcoming to combat acute pancreatic disease, the best results will be obtained by conservative management of all cases. This applies not only to lesions of a transient nature but also to the more severe lesions of hemorrhage, suppuration, and necrosis. If, on operation, evidence of acute pancreatic involvement is found immediate closure of the abdomen without further interference is recommended, and eradication of the biliary-tract disease should be delayed until the acute attack of pancreatitis has completely subsided.

RICHARD J. BENNETT, JR, M D

Graham, H F, and Hoeffle, M E. Acute Cholecystitis *Ann Surg*, 1938, 108 874

The authors review the literature with regard to the mortality rate of operations for acute cholecystitis carried out within forty-eight hours of the onset of the condition. There was a mortality rate of 3.59 per cent for 167 cases of acute cholecystitis operated upon within this time.

The authors discuss the difficulty of cholecystectomy for acute cholecystitis. They recommend that the gall bladder be aspirated and that it be removed from above downward. The bleeding of the liver bed may be controlled by pressure with a gauze pad and a retractor. To avoid the possibility of severance of the cystic duct, they recommend that the duct be ligated with traction toward the common duct instead of away from it. Excessive bleeding may be controlled by pressure on the hepatic artery until the bleeding vessel has been clamped and ligated. Free omental grafts may be anchored to the liver bed if its obliteration is impossible by the usual methods. The majority of the cultures taken during the first forty-eight hours are sterile.

A review of the literature tends to show that delayed surgical treatment in acute cholecystitis gives a mortality rate of 10 per cent, as compared with 3.5 per cent in cases operated upon within forty-

very consistency and may extend through the mu cosa and muscle to involve the peritoneal coat. As the tumor enlarges it comes in contact with the opposite wall of the appendix and causes obliteration of the lumen. It may occur as an annular thickening of the appendix wall or the lesion may be so small that it is discovered only upon microscopic examination. The tip of the appendix is most commonly affected. The tumor is three times more common in the female than in the male. Seventy per cent of the patients at operation were below thirty years of age.

Although the main feature stressed for carcinoids is their benignity it is now conceded that an occasional malignant change may occur. Thus Cooke in 1931 reported that 20 per cent of all carcinoids were malignant but appendicular carcinoids are very rarely malignant. Microscopically the tumor is seen to consist of clumps and masses of large spheroidal cell lying in a fibrous stroma in which there may occur a good proportion of involuntary muscle fibers. The cells have round distinct nuclei but in the larger cell masses the cytoplasmic borders are often ill defined. They bear no resemblance to the ordinary columnar or mucus cells lining the gastro intestinal tract. It is generally believed that the Kultschitzky cell are the site of origin of carcinoid tumors. Thus they would be more accurately termed argentaffinomas but the adjective carcinoid appears to be more deeply rooted in medical nomenclature.

The disease has never been diagnosed before operation or autopsy. It may be responsible for an acute attack of obstructive appendicitis. In cases without marked obstruction a mucocoele may result. Very rarely is there extension of the tumor. Only 1 case with metastases to the liver has been reported. The tumor is clinically benign and the results of simple appendectomy are excellent. Should extensive glandular involvement occur a classical excision of the right colon together with the involved glands will give an excellent postoperative result.

Three years ago the author encountered 2 cases of obstructive appendicitis due to carcinoids. A search of the records of the Royal Victoria Infirmary, Newcastle on Tyne during the ten year period from 1917 to 1936 revealed no additional cases which are briefly summarized.

JOHN W. NICHOLSON, M.D.

Daniels, E. A. Prolapse of the Rectum. *New Internat Clin* 1938 4 202

Prolapse of the rectum may be defined as a loosening and unnatural freeing of the rectal mucosa or muscularis or both. In this condition the supporting structures of the rectum are all abnormally relaxed which permits the extrusion of this terminal portion of the bowel through the anal orifice. Rectal prolapse occurs in two main degrees (a) prolapse of a superfluous redundant mucous membrane and (b) prolapse of the muscle coats of the rectum. In the mucous membrane variety of rectal prolapse the protrusion is smooth and easily sucked back into the bowel lumen. Complete prolapse presents itself

as a large thick mass and has an apex at its lowest extremity. Reduction is not easily effected as is the case in mucosal prolapse.

The factors which cause prolapse of the mucous membrane of the rectum are quite different from those which come into play in the development of complete rectal prolapse. The mucosa of the lower rectum is normally very loosely attached to the submucosa with fibrous and elastic tissue. This loose attachment leads to redundancy which is especially evident on the anterior and lateral walls of the lower rectum. If the anal orifice permits this redundant superfluous mucous membrane may be extruded and the condition known as mucous membrane prolapse becomes established. The patient may be conscious of a feeling of fullness as if a foreign body were present in the rectum. The writer uses the name of concealed mucous membrane prolapse for this variety of lesion. Backache may be a frequent complaint. Constipation is a common occurrence since this redundancy fills the lower rectum and precedes the stool. Such individuals frequently develop a low grade proctitis with anal fissures and pruritus. There may be a mucopurulent discharge.

In the type of individual in whom the anal canal is not tubular but short stout and patulous a mucosal redundancy will be easily extruded. Prolapse of the rectum in children may prevent itself as a mucous membrane type or as a complete prolapse including the muscle coats. The plane of the infant pelvis is rather vertical and the inner surface of the sacrum quite flat. The coccyx possesses very little of a forward tilt and may lie almost in a straight line with the sacrum. The anal orifice has a more posterior position than that seen in adults and a line drawn from the tip of the coccyx will be found to be almost in a straight line with the anal orifice. It is thus evident that in an infant undue loss of weight, diarrhea and straining at stool are frequently sufficient to initiate either an incomplete or complete prolapse of the rectum. In the author's cases of complete prolapse of the rectum the entire rectum descended through the anal orifice. Reduction may be easily effected or it may be impossible. Obstruction of the blood supply through the prolapsed bowel occurs. Edema follows and in severe cases the lesion may present itself as a large bluish edematous deeply engorged mass with superficial areas of necrosis on the surface of the lesion.

Obviously one cannot reconstruct the pelvis nor remove all of the predisposing factors operative in the production of rectal prolapse. It is essential that the operator determine whether the lesion is a mucous membrane prolapse or whether he is dealing with a complete prolapse. The author bases his opinions on experience gained in the treatment of 22 cases of complete rectal prolapse and more than 50 cases of incomplete mucous membrane prolapse. The plan of treatment consisted in obliteration of the redundant superfluous mucous membrane with a sclerosing solution, fixation of the rectum in the

pelvis (this organ is surrounded with an area of dense inflammatory scar tissue by means of a sclerosing solution), repair and reinforcement of the anorectal sphincteric musculature, and, finally, perineorrhaphy in both males and females to supplement the first three procedures. In this series of patients, conservative measures sufficed either to completely correct the disturbance in the majority of the patients or to give sufficient relief to make the patient's life agreeable. The author has never had to carry out the operation of rectosigmoidectomy. However, this very radical operation has a definite place in dealing with the intractable type of prolapse.

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A review of the literature tends to show that delayed surgical treatment in acute cholecystitis gives a mortality rate of 10 per cent, as compared with 3.5 per cent in cases operated upon within forty-

eight hours. Cases have been reported in which a totally gangrenous gall bladder was found seven hours after the acute onset of pain. The reported incidence of gangrene is about 20 per cent in the majority of series of cases of acute cholecystitis. Since delayed treatment apparently gives a much greater mortality rate, it is urged that operation in acute cholecystitis be carried out within the first day or two after the onset of symptoms.

ROBERT ZOLLINGER, M.D.

Rehuss, M. E. *The Problems of the Postoperative Gall Bladder Patient*. Med. Clin. North Am. 1938 22: 1683.

A general discussion is given of the diagnostic problems associated with gall bladder disease which is not relieved by gall bladder surgery. The status of the appendix is considered in all cases with persistent digestive symptoms. A study of the right lower quadrant is made also in all such cases. There is a relatively high incidence of peptic ulcer in association with gall bladder disease and duodenitis is commonly associated with gall bladder disease. It is emphasized that removal of the gall bladder does not necessarily improve the duodenitis or the cholangitis. These conditions require further medical therapy. Abdominal indigestion in middle life requires that malignancy especially of the stomach, pancreas and colon be ruled out. Cholangitis requires further diagnostic measures and treatment by means of the duodenal tube. Surgery is not performed for hepatitis or when the function of the liver is seriously impaired. These disorders may be recognized if appropriate tests of the liver function are carried out. A low grade pancreatitis is not easily recognized. The surgeon should palpate the pancreas at the time of cholecystectomy for evidence of induration and thickening. The presence of pancreatitis may be recognized by means of appropriate duodenal tests and the pancreatic type of stool.

Satisfactory medical treatment can usually be carried out with appropriate diet. Seventy-five per cent of the patients with gall bladder disease are constipated and show some signs of colitis or colon dysfunction. About 65 per cent of the patients who have had cholecystectomy as long as ten years previously present the same phenomena. The majority of these cases were of the spastic type. Medical treatment was directed toward the use of sedatives and antispasmodics. A right renal calculus may produce symptoms simulating gall bladder disease. A miscellaneous group of conditions such as adhesions, tabetic crises, abdominal angina, coronary vessel disease and lead poisoning must be considered in the differential diagnosis of gall bladder disease.

Cholecystectomy is justifiable when the function of the gall bladder is hopelessly compromised.

The author emphasizes that not every case of calculous cholecystitis need be treated by cholecystectomy and that there is an optimum time for gall bladder surgery. Furthermore, a clinician should

remember that removal of the gall bladder with gall stones does not insure healing of the liver and biliary passages. The author believes that it is possible for stones to recur in the common duct.

Medical treatment of cholangitis is given; it consists of an effort to improve function of the colon to stimulate liver activity to clear the ducts by the use of the intestinal tube with mineral water therapy and of various methods such as vaccine therapy and filtrate therapy to improve the patient's resistance. Any possible focus of infection is removed.

ROBERT ZOLLINGER, M.D.

Gray, H. K., McGowan, J. M., Nettrour, W. S. and Bollman, J. L. *Hepatic Damage in Biliary Disease: Its Relation to the Concentration of Bile Acids in the Bile*. J. Clin. Surg. 1938 37: 75.

A clinical study was made of 50 cases of biliary disease in which drainage of the common bile duct was established by means of a T tube. The condition of the liver was estimated from the history from the results of recognized tests of hepatic function and from the gross appearance of the liver at operation. The degree of hepatic damage thus determined was correlated with frequent determinations of the concentration of bile acids in the bile.

Low concentrations of bile acids were found in every case in which there was other evidence of hepatic damage. An inhibition of the concentration of bile acids by the liver occurred postoperatively. Recovery from this inhibition was rapid in the cases in which the liver was clinically normal but in the cases in which the liver had been damaged it was slower. A moderately damaged liver may continue to improve slowly even after a month of T tube drainage.

MISCELLANEOUS

Payne, R. L. *Spontaneous Rupture of the Superior and Inferior Epigastric Arteries Within the Rectus Abdominis Sheath*. J. S. G. 1937 103: 757.

In the presence of spontaneous rupture of the epigastric artery the patient usually complains of sudden severe pain in the abdomen, either to the right or left of the midline and at about the level of the umbilicus. With rapid development of massive hemorrhage the pain is sometimes severe and there is frequently nausea and vomiting. The temperature is normal or increased, there is a moderate leucocytosis and often a tender, localized mass of varying size is found to be confined to the sheath of the rectus muscle. One feature of the mass is that it does not change its position and always appears to be fixed to the abdominal wall. Ecchymosis is a most important sign, generally offering the first intimation as to the correct diagnosis. Too frequently the condition has been diagnosed as an acute intra-abdominal lesion.

The history of 3 cases of spontaneous rupture of the epigastric vessels is reviewed.

Possible etiological factors are considered and the literature is summarized. Muscular effort, such as coughing and sneezing, is reported in many cases. The condition has often been found to occur in association with infectious processes, such as tetanus, tuberculosis, typhoid, influenza, and low states of muscular inanition. Degeneration of the blood vessels must also be considered an important contributing factor, for in practically all of the cases reported the individuals were in late middle life, and all showed evidence of sclerosis and vascular degeneration, which was indicated by varying degrees of hypertension. Latent blood dyscrasias, C avitaminosis, and spontaneous rupture due to focal degeneration of the muscle and vessels are considered. Quite an important group are those occurring in pregnancy, during parturition, or soon after delivery.

There is no informative record covering the underlying pathology of this condition. Vascular disturbance followed by hyaline degeneration is the principal pathological lesion associated with the rupture of muscle or vessels within the rectus sheath. The anatomy of the rectus muscle and its blood supply is briefly reviewed.

The impression is almost universal that spontaneous rupture of the epigastric artery is a very rare occurrence. The literature controverts this idea. There have appeared in the last decade 77 articles recording 165 cases of this condition for analysis. Probably twice that number of cases were observed during the same period, but were not reported. Proper treatment consists of early and correct diagnosis, followed by prompt operative evacuation. The principal danger lies in a mistaken diagnosis and procrastination in operation. In a large percentage of delayed operations, infection of the hematoma is superimposed and becomes a grave complication.

HARVEY S. ALLEN, M.D.

Frank, R. T. Primary Retroperitoneal Tumors
Surgery, 1938, 4: 562

Between the years 1925 and 1936 there were reports in the literature of 107 primary retroperitoneal tumors. The author did not include in his review neoplasms arising specifically from residual

urogenital embryonic rests. The majority of the growths were mesodermal in origin (72 per cent), while 18.7 per cent were ectodermal (neurogenic), and 9.3 per cent were teratomas.

The retroperitoneal tumor may vary greatly in size, one tumor, as noted in the literature, weighed 69 pounds. Such tumors may be solid or cystic and, with exception of the round-cell sarcomas, are well encapsulated. Multiple masses, often unconnected, may be present, and the failure to remove all such masses is believed by the author to be responsible for the recurrence of the benign tumors.

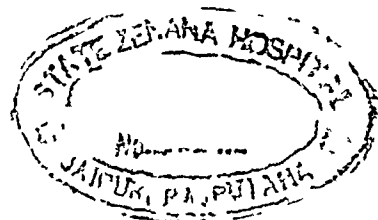
Histologically, these tumors fall into the following groups: lipomas, fibromas, cysts, myxomas, sarcomas, neuromas, and teratomas. In the author's series of 107 cases, recurrence was noted in 13 per cent, with metastases in 3.7 per cent, while in an older series metastases occurred in 33 per cent of the cases.

While the clinical symptoms are not characteristic, vague digestive disturbances, an abdominal mass, and loss of weight and strength are the rule. Most often the pre-operative diagnosis is that of fibroids, ovarian cysts, hypernephroma, and tuberculous peritonitis. Gastro-intestinal and renal x-ray studies are of great value, both for exclusion and as a means of locating the tumor.

Operation is the treatment of choice, and it is important that even benign growths be prevented from increasing to great size or death will be the probable outcome. Only 10.1 per cent of the patients seen clinically were inoperable. Radiotherapy combined with surgery or used alone is valuable except in the lipomas and fibromas. The method of approach has been both retroperitoneal and transperitoneal. The operative risk is more closely allied to the histology of the tumor than its size. The mortality rate was 0 for benign tumors, 18.2 per cent for myxomas, 22 per cent for neuromas, 28.1 per cent for sarcomas, and 36.7 per cent for teratomas.

The author adds 3 new cases, the first an embryonic tumor of mesodermal origin, the second a myxoliposarcoma, and the third a retroperitoneal cyst that the author does not consider mesenteric in origin.

EARL O. LATIMER, M.D.



GYNECOLOGY

UTERUS

Gross G The Pathogenesis of Genital Infarcts Due to the Intra Uterine Injection of a Soap Solution (La pathogénie de l'infarctus génital par injection intra utérine d'eau savonneuse) *J de chi* 1938 52 312

Gross notes that the occurrence of genital infarcts as a complication of the intra uterine injection of soap solution is rare in comparison with the frequent employment of such solutions to produce abortion. The pathogenesis of this lesion is doubtful. A number of cases have been reported in which there was an associated infection of the uterus but in other cases the lesions have been purely vascular with no signs of inflammation or infection. A number of detailed case reports show that all types of soap have been employed in cases in which an infarct has resulted. The injection has sometimes been made by the patient herself and sometimes by the more brutal methods of the professional abortionist. Thus in one of the cases observed by the author in which an infarct resulted the injection of a 2 per cent solution of dark soft soap had been made without force by the patient herself. In another case in which the patient made an uncomplicated recovery after curettage an 8 per cent solution of soap had been injected under pressure. As the clinical facts do not throw much light on the pathogenesis of an infarct the author carried out a series of experimental studies using various forms of soap.

In pregnant rabbits the uterus was exteriorized so that the progress of the sound introduced per vaginam could be observed. It was found that this sound often tore the placenta or injured the uterine wall so that the soap solution injected entered the maternal circulation. The caustic action of the soap was not found to be sufficient to produce the extensive lesions found in a genital infarct. It was found however that soap solutions added to defibrinated and washed red cells caused hemolysis and hemolytic thrombosis; this action was most marked with solutions of the highest pH. In carrying out experiments on pregnant rabbits it was found that if the soap solution was injected into the placenta near its point of attachment it entered the uterine veins and there produced complete thrombosis.

Further experimental studies showed that the soap solution caused a marked vasomotor reaction by irritation of the vascular endothelium which resulted in vascular paralysis especially of the capillaries. In cases in which a genital infarct resulted from an intra uterine injection of a soap solution it was evident that the solution must have reached the maternal circulation however in order to produce an abortion it is necessary only that the embryo be perforated. The pregnant uterus is well vascularized and in a state of functional activity; this factor

increases the sensitivity of its vessels to vasomotor irritants.

An infarct causes a state of necrosis which favors the multiplication of micro-organisms and the spread of infection as is often observed in cases of infarct resulting from the intra uterine injection of soap solution. The infection is not however necessary for the production of the infarct. The author states and indicates that an infarct is the result of the action of the soap solution on the blood and the blood vessels.

Alice M. Meyers

ADNEXAL AND PERIUTERINE CONDITIONS

Thomson J G and Stabler F Lipoid Rich Granulosa Cell Tumor with a Discussion on Theca Cell Tumor *J Obst & Gynec B & Emp* 193 45 760

A case is described in which the patient a sixty five year old woman presented herself with a history of periodical bleeding which occurred every two or three months for fourteen days at a time. The menopause had occurred at fifty years of age. In the lower abdomen was a rounded mass reaching to the umbilicus. It was mobile and not tender softer than a fibroma but not cystic. The mass was separate from the uterus. The latter was distinctly enlarged. A diagnosis of granulosa cell tumor was made. At operation the internal genitalia were removed. Examination of the tissue revealed that the uterus was definitely enlarged for a woman of sixty five after fixation it measured 8 3 by 6 by 3 5 cm. The endometrium was very thick and hyperplastic. Microscopically it showed extreme glandular hyperplasia of the secretory type. The stroma was relatively scanty but its cells were plump oval and active looking. The right ovary was replaced by a large rounded solid tumor measuring 8 5 by 8 7 by 4 cm. The growth was smooth and covered by a thin translucent capsule under which yellow tumor tissue could be seen. The cut surface presented a bright yellow color quite homogeneous apart from scanty strands of grayish connective tissue there was no hemorrhage or degeneration. The growth resembled a gigantic solid corpus luteum. Microscopically the tumor was very cellular formed of small cubical cells arranged in columns closely packed together. The general pattern was that of moiré silk. Mitotic figures were infrequent. The growth contained much lipid in the form of tiny droplets in practically every tumor cell. Most of the fat was doubly refracting. Chemical analysis of a portion of the tumor revealed that 9 35 per cent of the moist tissue was fatty 15 8 per cent being free cholesterol 70 2 per cent cholesterol ester 12 6 per cent neutral fat and 1 per cent phospholipid. Tumors of the ovary with high lipid content and a yellow color have been described in the literature.

under the names of hypernephroma, luteinizing granulosa-cell tumor, and theca-cell tumor. The authors believe that there is no proof of the existence of primary ovarian hypernephromas, moreover the histological structure of the tumor under discussion did not in any way suggest hypernephroma.

Since 1932, some 18 cases of so-called theca-cell tumor of the ovary have been reported. Geist gives the following points of differentiation from a granulosa-cell tumor: (1) the theca-cell tumor is a hard fibrous tumor, while the granulosa-cell tumor is softer and more medullary, (2) it is not like a granulosa-cell tumor, histologically, but is formed of connective-tissue cells and has a much more uniform structure, (3) the lipid content of granulosa-cell tumors is scanty and mainly extracellular, while in theca-cell tumors it is more abundant, mainly intracellular, and consists of cholesterol and cholesterol esters, and (4) the theca-cell tumor is attended by definite clear-cut symptoms, atypical postmenopausal bleeding, and hyperplasia of the endometrium.

Careful analysis of the 18 reported cases leads the authors to doubt the authenticity of theca-cell tumors as a "clearly defined group." They believe, with Motta, that granulosa-cell tumors are of mesenchymal and not of epithelial origin, and that epithelium-like tumor elements in theca-cell tumors are just as frequent as sarcoma-like elements in granulosa-cell tumors. In other words, they doubt a difference in origin between the 2 tumors. If their opinion is correct, the main point of difference between these tumors is removed. Nor are all of the theca-cell tumors hard and fibrous. Five of 10 such tumors, as reported by Loeffler and Priesel, were soft. Yellow areas of lipid deposition, while not common in granulosa-cell tumors, have been a marked feature in a number of the cases reported. The statement that the lipid in theca-cell tumors is mainly cholesterol and its esters, while in granulosa-cell tumors it is phospholipin is also doubted. There are enough reports in the literature of doubly refracting lipoids in granulosa-cell tumors to make this point of differentiation of little value. Even the "clear-cut, definite syndrome" is lacking in many of the cases, the history of bleeding being very variable. On the whole, the authors doubt the existence of a special group of ovarian tumors with the characteristics described.

The histological structure of the tumor reported was typical of a granulosa-cell tumor of the cylindrical type. The moiré silk pattern was well marked and the only unusual feature was the very high lipid content of the tumor cells. A few reports of lipid-rich granulosa-cell tumors were found in the literature. Curiously enough, all were of the cylindrical type with the moiré pattern. Hormone studies were not made in this case, but the secretory type of endometrial hyperplasia and the absence of development of the breast are more in favor of an excess of luteal hormone than of estrin. On the other hand, the onset of menopausal symptoms

which followed removal of the tumor suggests that estrin was also being produced by the tumor. The authors believe, therefore, that their tumor is an instance of luteinizing granulosa-cell tumor, but until more hormonal evidence is at hand they prefer to give it the non-committal designation of lipid-rich granulosa-cell tumor.

The patient was free of recurrence twelve months after operation. The gross and microscopic characteristics of the tumor suggested a benign growth. The authors believe that luteinization is of good prognostic significance. DANIEL G. MORTON, M.D.

Chaher, A. Total Linear Salpingotomy, Technique and Indications (La salpingotomie linéaire totale, technique et indications) *Rev. franç. de gynéc. et d'obst.*, 1938, 33, 577.

In total linear salpingotomy the fallopian tube is opened its entire length, except for the interstitial portion, and spread out flat. As a preliminary step, it must be freed from whatever adhesions may be present, and mobilized. An assistant holds it steady by means of two forceps applied right and left to the distal part of the pavilion. A fine grooved sound is introduced into the tube up to the uterine wall, if possible, and the tube is incised longitudinally along its upper border in order to respect the integrity of the vessels and nerves of the mesosalpinx. In cases in which the pavilion is closed, a nick is made in the ampullary portion to allow introduction of the sound. Any inflammatory nodules or caseous masses are removed with the knife or destroyed with the thermocautery or the galvanocautery, care being taken not to interrupt the continuity of the tube. If a large pocket is found, its most distended portion is resected. If the upper border of the tube has been followed, there will be little bleeding, and this is easily controlled by means of a compress. The spread-out tube is then fixed by one or two points of salpingopexy suture to the parietal peritoneum or to the infundibulo-ovarian ligament. The tube may be protected by a catgut sheet, but this is not indispensable in all cases. The question of drainage depends on the nature of the lesions found. A flat vaselined strip of gauze, folded like an accordion, is recommended for support of the tube below and for cover of its upper part so as to isolate it from the epiploon. Issuing at the level of the pubis, it will not interfere with solid and complete reconstruction of the abdominal wall. In some cases it may be found advisable to evert the tube completely as is done in the operation for hydrocele of the testicle.

The object of this operation is to conserve the diseased tube, to favor its healing, and if possible to obtain restitution to its former condition, the indications will consequently depend on the age of the patient and the nature and degree of the lesions present. Conservation of the tube is justified by the indication to safeguard the ovary whenever possible and by the hope of restoring the function of the tube as oviduct. The best way to safeguard the ovary is to conserve the tube with all the neurovascular con-

nections that unite the two organs and make of them an anatomical and physiological unit which should not be dissociated. Therefore total linear salpingotomy is indicated in any subacute or chronic salpingitis no matter of what nature. With the exception of pyosalpinx this intervention is sufficient to heal the disorder as proved by the rapid disappearance of the symptoms. It allows restoration of the tube as an oviduct in certain patients as proved by the case of a previously sterile young woman who was salpingotomized and forty months later came under observation for a painful small tumor of the uterus. She had been pregnant for four months. At operation a fibroma was removed by myomectomy and it was observed that the tubes were free from adhesions and were so perfectly reconstructed that no trace of the former operation could be found.

RICHARD KEMPEL, M.D.

EXTERNAL GENITALIA

Hall W. E. B. Vaginal Hernia with a Review of the Literature. *Arch Surg* 1938 37 651

Vaginal hernia is a herniation of the peritoneum pushing downward through the pelvic floor into the vaginal vault or along the wall between the vagina and the rectum or bladder, sometimes extending all the way to the perineum. This type of hernia represents a subvariety of pelvic hernia, the latter term including all hernias through the pelvic floor. The condition is rare.

An attempt is made to review the literature. The reports indicate a lack of reliable statistical data on vaginal and pelvic hernias because of the multiplicity and uncertainty of terminology and diagnostic requirements and because of inadequate examinations and reports and mistaken interpretations. By strict standards some 26 cases have been reported by the broader interpretation of accepting the diagnosis of the examining physician. 83 cases have been reported. The author reports a case of his own in which for the first time microscopic examination of the involved tissues was made. It was indicated that an aneurysmal relaxation of degenerated tear tissue resulting from obliterative endarteritis occurred and that this may be expected in senile and arteriosclerotic patients in the absence of traumatic and congenital changes and act as a contributing factor with them.

Anatomically vaginal hernia occurs most often in the bottom of the cul de sac, the internal ring being formed by the uterosacral ligaments and the anterior rectal wall or by separated fibers of the pelvic fascia levator ani muscle and the cervix. Less frequently it occurs anterior to the cervix. Etiologically congenital maldevelopment and defects and variations in the pelvic floor are main predisposing factors. Trauma at birth is of course the chief contributing cause.

Frequently vaginal hernia is not diagnosed at the first examination or operation (e.g. operation for prolapse or rectocele) and must be differentiated from various pelvic and vaginal conditions particularly rectocele, cystocele and prolapse of the uterus. It must also be differentiated from abscess, cyst, hematoma, lipoma, polyp, fibroma and cysts of Gartner's duct. One should note carefully if the mass is reducible and has a hernial ring at the base.

Usually vaginal hernia causes discomfort only but in 1 of 4 cases the condition is complicated. The complications reported were interference with normal delivery, incision or excision due to error in diagnosis, pelvic abscess, rupture with evisceration, death from incarceration. If the condition develops during labor the signs may be those of shock and intestinal obstruction. The treatment in this case is immediate return of the head and reduction of the hernia. Obstruction and strangulation from other causes demand immediate surgical intervention.

The treatment is surgical with an abdominal, perineal or a combined approach. The second is usually to be preferred. The vaginal mucosa is incised longitudinally over the mass and the sac is carefully exposed by blunt dissection. If an intestinal loop is in the sac the patient's hip is elevated to effect reduction. The sac should be opened with the greatest care and cut short and the stump sutured behind the cervix or the sac may be sutured whole to the uterine surface as an additional support to the pelvic floor. The pelvic floor is then closed by cross or purse string sutures after which perineovaginal defects are corrected, excess vaginal tissue is trimmed off and the operative wound closed. All factors which cause increased intra-abdominal pressure such as obesity and tumors should be corrected by appropriate prophylactic surgical and medical procedures.

DANIEL G. MORROW, M.D.

OBSTETRICS

LABOR AND ITS COMPLICATIONS

Motta, G Causes for the Greater Resistance of the Lower than of the Upper Hysterotomy Scar Silent Rupture of the Lower Hysterotomy Scar During Labor (Sulle cause di maggiore resistenza della cicatrice isterotomica segmentaria rispetto a quella corporea Rottura silenziosa di cicatrice isterotomica segmentaria in travaglio di parto) *Arch di ostet e ginec*, 1938, 2 408

Recent statistics show that rupture of the upper hysterotomy scar during a subsequent pregnancy or labor occurs in 2 per cent of the cases and that the adoption of suprasymphyseal hysterotomy has notably reduced the incidence of rupture to 0.28 per cent, however, on anatomical and physiological grounds it would seem reasonable to expect an increase in the frequency of rupture after hysterotomy of the lower segment In order to evaluate the conditions that may determine or favor the rupture of a hysterotomy scar, the author describes an unusual case of extensive rupture which occurred in the beginning of a labor subsequent to a low hysterotomy performed one year previously The rupture was discovered early and remained subperitoneal because of timely surgical intervention Although the numerous and strong adhesions between the lower uterine segment and the abdominal wall might have contributed to retard complete rupture, this condition would nevertheless have eventually occurred with the progress of labor The placenta was inserted rather low on the anterior wall of the uterus, partly on the site of the hysterotomy scar The rupture did not give rise to any symptoms and was discovered only through vigilant obstetrical observation An important pathogenetic fact in this case was the discovery of markedly defective repair of the previous hysterotomy wound

The advantages of the low over the high hysterotomy, consisting in less peritoneal trauma, complete covering of the uterine wound with peritoneum, and less frequent rupture of the scar during a subsequent pregnancy or labor, are connected with the life of the patient but not with her health, as there is a decided incidence of healing by second intention or of a febrile puerperium It is evident that muscular regeneration cannot be better in low than in high hysterotomy and that there must be some other explanation for the rarity of rupture of the lower hysterotomy scar This explanation is to be found in the site of insertion of the placenta with infiltration of the scar by chorial elements favored by insufficient or incomplete decidual protection at this level, many cases, including the present case, have been reported in which low insertion of the placenta on the site of or close to the hysterotomy scar was present It has been noted that, of the various types of upper hysterotomy in use, those of the fundus threaten with the greatest danger of rupture during

subsequent pregnancy or labor and those of the anterior wall of the uterine body are associated with less danger, on the other hand, the hysterotomy scar of the lower segment of the uterus is only rarely involved by rupture These findings agree with the relative frequency of insertion of the placenta at these sites and show that the presence of any degree of placenta previa should arouse suspicion of the possibility of rupture when a low hysterotomy has been performed previously RICHARD KEMEL, M D

Manévitch, A E . Spontaneous Amputation of the Uterine Cervix During Labor (Amputation spontanée du col de la matrice pendant l'accouchement) *Gynécologie*, 1938, 37 513

Manévitch reports the case of a primipara, in whom during the expulsive stage of labor, an oval body of bluish color appeared at the vaginal opening with each uterine contraction In appearance it was not unlike the scrotum of a male infant in a breech presentation, but examination showed the child to be presenting normally Vaginal examination revealed that this body was the vaginal portion of the cervix uteri, and that it was almost completely detached from the uterus and the vaginal vault except for a small flap of tissue at the anterior lip The infant was delivered with forceps, during the manipulation of the forceps, an attendant pushed the detached portion of the cervix up, the child was delivered in good condition without signs of asphyxia, the placenta was expelled spontaneously in ten minutes After delivery, examination showed the vaginal portion of the cervix to be completely detached, as if severed with a knife, except for a small portion of the anterior lip by which it was suspended, there was no bleeding The spontaneous amputation was completed by a transverse incision of the tissue at the anterior lip On the fourth and fifth days of the puerperium, the patient developed some fever (38° C), and there were signs of a mild endometritis, but these symptoms subsided under local treatment and the patient was discharged in good condition

The patient was a French woman thirty years of age, her development as a child had been somewhat retarded, menstruation had been irregular and scanty, although married four years and having used no contraceptive measures, she had never been pregnant previously Examination of the amputated cervix showed the opening of the external os to be only 2 cm in diameter, the walls of the cervix from 15 to 20 mm in thickness, and the length of the vaginal cervix from 37 to 38 mm Histological study showed the muscular tissue of the cervix to be incompletely developed, resembling that of a child, the elastic tissue was much diminished in comparison with the normal The author is of the opinion that the congenital or constitutional rigidity of the cervix

in this woman with a hypoplastic constitution and infantile development was the chief cause of spontaneous rupture of the cervix during labor.

A review of the literature shows that such spontaneous rupture of the cervix is of rare occurrence. It is usually not accompanied by hemorrhage; the chief danger is the formation of a vesicovaginal fistula and septic infection in the puerperium.

ALICE M. MEYERS

Courtois J and Bouchacourt C. A Report on 158 Cases of Low Cesarean Section. Indications and Results (A propos de 158 cas de césarienne basse: indications et résultat). *Rev. Franç. de Gynéc. et d'obst.* 1935 33 790

Courtois and Bouchacourt report 158 cases in which low cesarean section was done in a period of six years at the hospital of Saint Germain en Laye. In 113 cases the operation was performed because of a definitely contracted pelvis and in 47 of these there was another associated cause of dystocia. In this group of 113 cases there were 7 maternal deaths (6.19 per cent) and 5 fetal deaths (4.42 per cent). In the 45 other cases there were various indications for the operation: there were 3 maternal and 3 fetal deaths, a mortality of 6.8 per cent. For the entire series of low cesarean sections the maternal mortality was 6.32 per cent and the fetal mortality 5.06 per cent. The conditions which caused the highest maternal mortality were uteroplacental apoplexy and a fibroma complicating the pregnancy. The highest fetal mortality was associated with prolapse of the cord, frontal presentation and central placenta previa at term.

A study of the maternal mortality in relation to the duration of labor shows that in 48 cases in which low cesarean section was done without any test of labor there were 3 deaths, a mortality of 6.25 per cent. If ~~the~~ ⁱⁿ cases of uteroplacental apoplexy is excluded, the mortality was 4.23 per cent. In 68 cases in which low cesarean section was done in the early stage of labor, i.e. before the twentieth hour, there were 2 maternal deaths, a mortality of 2.94 per cent. When the operation was done between the twentieth and fortieth hours of labor the maternal mortality was 10 per cent (2 deaths in 20 cases). In 3 cases in which operation was done after prolonged labor (over forty hours) there was one death (33.3 per cent). In 13 cases in which low cesarean section was done when the woman showed clinical symptoms of infection the maternal mortality was 15.3 per cent (2 deaths in 13 cases). The fetal mortality also was lowest in the cases in which the low cesarean section was done after labor had begun but before the twentieth hour. The time of the rupture of the membranes also appeared to influence the maternal mortality. The lowest mortality was observed in those cases in which the section was done within twelve hours after rupture of the membranes.

These findings indicate that the most favorable time for the performance of low cesarean section is in the early stage of labor within a few hours after

rupture of the membranes. In complicated cases (in which there is more than one cause for the dystocia) the fetus is less resistant than the mother; in such cases the operation should be done within ten hours after the beginning of labor, especially if the membranes have ruptured in the interests of the child.

In this series of cases there were 63 in which the indication for low cesarean section was considered to be absolute: in 22 cases for contracted pelvis of a degree that rendered obstetrical delivery impossible; i.e. with a true conjugate of less than 8 cm. in 7 cases for severe and dangerous failure of the uterine contractions; in 7 for threatening uterine rupture; in 10 for central placenta previa; in 8 for severe dystocia of the soft parts; and in 5 for general conditions rendering prolongation of labor dangerous.

In 83 cases the indications for low cesarean section were relative but failure to operate would have involved sacrifice of the infant. In 16 cases the danger of asphyxiation of the child was the chief indication; in 23 cases faulty presentation or a large child; in 22 cases contracted pelvis with a true conjugate of over 8 cm.; in 2 cases recent prolapse of the cord; in 7 cases failure of uterine contractions with less than 50 symptoms than in the previous group; and in 6 cases an elderly primipara who greatly desired a living child.

In 16 cases low cesarean section was done even though it involved a definite risk but it appeared justifiable as giving the best chance for both mother and child. In 7 cases there was definite infection; in 1 case that of a primipara of twenty-four years there was uteroplacental apoplexy; and in 8 cases there were multiple fibromas or fibroma previa.

Aside from such complications the maternal mortality in low cesarean section is about 3 per cent whatever the indications for the operation. In determining whether or not a low cesarean section should be done when the indication is relative the obstetrician must consider the age of the patient, her general condition, her own desire in the matter and the possible effect on future pregnancies.

ALICE M. MEYERS

MISCELLANEOUS

Garland L. H. The Shape of the Female Pelvis and Its Clinical Significance. *Further Roentgen Studies.* *Am. J. Roent.* 1935 40 39

Female pelvis may be classified into 4 main types: (1) the round or gynecoid; (2) the blunt heart shaped or android; (3) the sagittal ellipsoid or anthropoid; and (4) the transverse ellipsoid or platypelloid. The obstetrical significance of the variations in shape is summarized by Caldwell and Morley as follows:

The gynecoid type of pelvis usually involves no special treatment during delivery except when found in the small generally contracted form in the android type, forceps are often necessary and if the condition is marked and diagnosed before the onset of labor cesarean section can be advised in the anthropoid form, rotation of the head is often diffi-

cult, and in the platypelloid form the head must not be rotated into the narrowed anteroposterior diameter. Previous studies made by the author and his associates, to confirm or disprove these findings, led to the conclusion that the morphological classification was a clinically feasible one and that, in a significant number of cases, a difficult labor could be forecast in patients whose obstetrical measurements by ordinary methods appeared normal.

However, it was believed (a) that in the roentgen diagnosis of the different types of pelvis, too much depended on subjective or personal opinions and too little on actual measurements, and (b) that a larger series of cases was desirable in order to confirm the validity of the conclusions drawn with regard to the prediction of dystocia. Accordingly, the study was continued and measurements were recorded of both the linear dimensions and the angles of the various architectural features relied upon in making a diagnosis. The present paper is a review of similar measurements taken in the last 150 cases, and a critique of the accuracy of the roentgen technique used in reproducing the structures under survey.

The architectural features on which this morphological classification is based are (1) the pelvic outlet, (2) the subpubic arch, and (3) the greater sciatic notch and sacrum. The method used to obtain images of these structures, from which accurate deductions could be derived, is described in detail. The basis for roentgen interpretation is discussed, and diagrammatic illustrations of the differential features of the various types are included. The means used for obtaining measurements are given, and the findings are tabulated.

In this group of 150 unselected primigravidae, 51 per cent were found to have gynecoid types of pelvis, 21 per cent had android, 18 per cent had anthropoid, and 10 per cent had platypelloid types of pelvis. Twenty-eight per cent had large inlets, 58 per cent had average size inlets, and only 14 per cent had small inlets. The clinical findings in this series of cases is to be published later. In the author's study of a previous group of 100 cases, the average duration of labor in the pure types was found to be as follows: patients with platypelloid types of pelvis, thirteen hours, with gynecoid and anthropoid pelvis, fifteen hours, and with android types of pelvis, twenty hours. It was also observed that while only 13 per cent of the pure gynecoid types required instrumental interference for dystocia, 40 per cent of the pure android types, 28 per cent of the anthropoid, and 33 per cent of the platypelloid types required such interference.

A short discussion of the combination of pelvimetry with pelviography is appended. Objections to the methods of Caldwell and Morley with the "precision stereoscope" are given. In the author's experience, Johnson's application of the McKenzie-Davidson method has not been found practical. It is believed advisable that the pelvis be studied by each method separately if complete information is desired. Since the majority of female pelvises are well within the normal limits in size, it will usually be of value to study them merely from the viewpoint of shape. However, in cases in which pelvimetry is indicated as well, the author believes that the method described by Johnson is simple and accurate.

ADOLPH HAPTUNG, M D



URINARY LITHIASIS

Collective Review

C C HIGGINS M D F A C S Cleveland Ohio

IN recent years numerous clinical and experimental observations have been made in an attempt to ascertain the etiological factors associated with the formation of renal calculi. The high incidence of recurrence that has been reported following the surgical removal of a calculus stresses the necessity for carefully planned pre operative and postoperative routines in all cases of urinary lithiasis. Certainly the operative procedure *per se* must be considered as only one phase in the treatment of patients with renal calculi.

ETIOLOGY

The relationship between the formation of urinary calculi and the absence of certain essentials in the diet has been noted by Fujimaki (30) in China and by McCarrison (63) who have found that definite stone areas (regions where calculi are unusually frequent) exist in India where the people live on an improperly balanced diet. Joly (53) states that in England (Fig. 1) stone areas occur in Derbyshire and Westmoreland. Similar areas have been reported in China, Egypt, Palestine, the valley of the Volga in Russia, and in Dalmatia. According to Holmes and Coplan (44) calculi occur more frequently in southern California and southern Florida than in any other part of the United States.

From a study of the numerous stone areas that have been reported in different parts of the world it is apparent that a definite deficiency in the diets of the inhabitants exists. This deficiency is not alone in Vitamin A but frequently in Vitamins B and D or in some instances the diet is improperly balanced with regard to the acid ash and alkaline ash foods.

Guersel (34) studied calculous disease in Turkey and states that it has been proved that the geographic distribution of calculi corresponds to the areas where the inhabitants exist on poorly balanced and inadequate diets. He believes that poor nutrition and avitaminosis play an important part in the formation of stones. Vermooten (92) has found that the South African negro does not experience the formation of renal calculi as evidenced by an examination of the records of

1 091 000 negroes admitted to the Johannesburg General Hospital. At the same time members of the white population in South Africa as illustrated by the records of 126 000 admissions have renal calculi in the ratio of 1:460 patients. He adds that the South African negro lives on a simple stable diet which is rich in Vitamin A, has an acid ash base and is low in its content of calcium. Noble (67) in Siam found the largest number of stones among the poorer classes who lived in agricultural districts and the greatest incidence occurred in the first ten years of life. He states: "There is no doubt that the children who suffer from stone have a diet deficient in Vitamin A." Boshamer (6) reports that the various surgeons who operate in the central parts of southern China as well as Siam and Indo-China have been impressed by the frequency of calculous disease in the second third and fourth decades of life. Almost without exception his patients who suffered with stones belonged to the poorest grade of society and he emphasized especially the frequency of vesical calculi in Kwangsi where he works. He believed that this was due to the fact that this is the poorest province in China and the diet of the inhabitants being comprised for the most part of boiled polished rice. Milk, fruit, meat and vegetables were only occasionally included and then in small amounts.

Joly (53) states: "I believe the hypothesis that stone is a deficiency disease is the most plausible and probable that has yet been advanced. It explains not only all the principle features of the condition today but also changes in its incidence during past years. I believe that vitamin starvation acts primarily on the renal epithelium and through it on the colloid mechanism of the urine. Also that once this mechanism is deranged, stone formation must follow as a direct result of the laws of physical chemistry. Similarly since the World War there has been a definite increase in the incidence of calculous disease in certain parts of Europe. This has been explained by the fact that large numbers of people were required to partake of improperly balanced diets during the period of the war. Geza Illyes (49a) substantiates this by his statement that renal calculus has increased enormously since the World

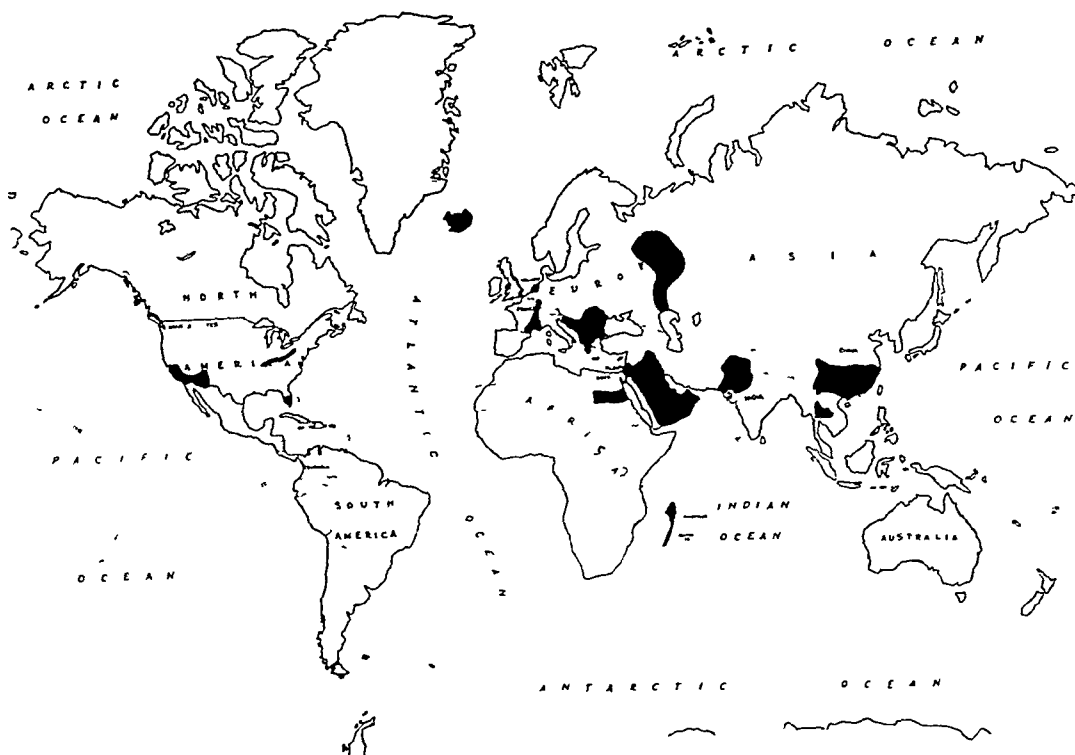


Fig 1 Map of the world illustrating the so-called "stone areas"

War, especially in countries where living conditions have been poor. This again emphasizes the relationship between the formation of calculi and deficiencies in the diet.

It is likewise true that in certain countries a marked decrease in the incidence of calculous disease in children has occurred during the last century. Denos and Minet (23) and Civiale (17) stated that in the last century calculous disease was one of childhood, but according to Joly's findings in England and France it is now no longer a disease of childhood but rather one of adult life. This has been attributed to dietary and nutritional progress. In the valley of the Volga in Russia, however, calculi are still unusually frequent in children.

In addition to clinical observations, experimental data has shown the relationship between calculous disease and a poorly balanced diet. Calculi, both renal and vesical, have been produced in white rats which were maintained on diets deficient in Vitamin A. Osborne, Mendel, and Ferry (69), Grossman (33), and others have made such observations, and in 1933 I reported a series of experiments in which white rats were

maintained on a diet deficient in Vitamin A for varying periods of time (39). At the end of two hundred days, post-mortem examination showed 88 per cent to have calculi of the bladder and at the end of two hundred and fifty days, renal calculi were present in 41 per cent.

Grossman (33), in a similar study, stated that microscopic particles of sand, which can be regarded as calculi, appear in the bladders of such experimental animals at the fifth week, but never in the kidney before the eightieth day. The majority of the calculi he found were composed of calcium phosphate.

Livermore, Bliss, and Prather (60) studied a group of 55 rats maintained on a diet devoid of Vitamins A and D. Calculi developed in 34 rats of this group while in 32 of 56 animals fed a diet devoid of Vitamin A, stones or sand developed. Van Leersum (91) and Perlmann and Weber (70) have substantiated these observations.

More recently, Hou (45) observed that by the addition of Vitamin D to the experimental diet which was deficient in Vitamin A, the incidence of the formation of calculi was increased, and the removal of Vitamin D from the same diet de-

creased the frequency of stone formation in albino rats

Following the publication of our clinical and experimental work (39, 40) the objection was made that there was no indication that even mild degrees of Vitamin A deficiency were present among any of the people of the United States. The criteria used by some authors and the basis of their impressions are gained only from the dietary history elicited from the patient. Such data are not sufficient to warrant the presumption that the patient is or is not receiving and utilizing adequate amounts of Vitamin A.

In addition biophotometric studies now reveal that deficiency in Vitamin A occurs clinically much more frequently than has been presumed. Jeghers (52) in a study of a group of 162 students attending the Boston University School of Medicine, found that approximately 35 had photometric evidence of Vitamin A deficiency and 12 showed clinical evidence. Youmans in discussing Jeghers' paper stated that he found subnormal dark adaptation in one half of 50 clinic patients the diets of many of whom were thought to be inadequate and in 11 of 54 supposedly normal subjects whose diets appeared to be well balanced. Jeans and Zentmure (51) in 1936 utilized the biophotometer test for detecting Vitamin A deficiency in 100 children of middle and low economic levels in a rural community. They found that 26 per cent had a positive test for Vitamin A deficiency and of 102 children of all economic levels in a village, 53 per cent presented similar findings. Of 70 children of middle economic level in the city 63 per cent gave a positive test. In a study of 62 children of low economic level in a city it was noted that a positive curve of Vitamin A deficiency was observed in 79 per cent. Of 18 village and city children who had positive tests of Vitamin A deficiency and to whom adequate amounts of Vitamin A were administered all but 3 developed normal adaptation to darkness after a period of Vitamin A therapy. Ezickson and Feldman (28) in 1937 by employing the dark adaptation or light sensitivity test found that in 25 patients with urolithiasis 24 had pathological adaptation from a mild to severe degree.

In the cases of renal lithiasis studied at the Cleveland Clinic from 68 to 74 per cent gave photometric evidence of Vitamin A deficiency (Fig. 2).

Clinical and experimental evidence therefore indicates that a relationship exists between the formation of calculi and the deficiency in Vitamin A and that biophotometric studies should be made in all cases of renal lithiasis.

HYPERPARATHYROIDISM

Barney and Mintz (4) Albright and Bloomberg (1) and others have stressed the relationship between hyperparathyroidism and renal lithiasis. In 1934 Barney and Mintz reported a series of 8 patients in whom a diagnosis of hyperparathyroidism had been made and verified by surgical intervention. In 11 (61.1 per cent) calculi were present in the urinary tract. Of the group of patients 11 were females and 6 males. The youngest patient was thirteen years of age, the oldest sixty two years, the average being forty three years. Involvement of the bones to varying degrees was present in 11 cases while in 6 cases urinary calculi and changes in the bones were found together. The calculi (renal) were bilateral in 4 (36 per cent) of the 11 cases. These observers concluded that hyperparathyroidism is responsible for from 4 to 5 per cent of the cases of renal lithiasis, in almost 70 per cent of cases of hyperparathyroidism stones may be present and in about 38 per cent of cases of hyperparathyroidism the patients may have pathological changes in the bones and in the urinary tract. Barney and Mintz assert, and Albright and Bloomberg concur, that hyperparathyroidism is so frequently a cause of the formation of renal calculi that it must be determined whether or not it is present in every case. A careful study of the calcium and phosphorus content of the blood should be made in all patients with renal stones.

Griffin, Osterberg and Braasch (32) in reviewing the cases of urinary lithiasis at the Mayo Clinic state that hyperparathyroidism was found to be an etiological factor in less than 0.2 per cent of their cases. At the Cleveland Clinic hyperparathyroidism has been associated with the production of renal calculi in 0.1 per cent of the cases (Fig. 3).

I believe however that it is important in all cases of renal lithiasis to determine the level of serum calcium and phosphorus in the blood and likewise the phosphatase content of the blood. If there is an elevation of the serum calcium and a lowering of the serum phosphorus further roentgen studies of the bones and an investigation of the calcium eliminated in the urine is advisable.

INFECTION

The relationship between infection and the formation of renal calculi has been discussed by several observers including Braasch (8) Bugbee (11) Heyer (54) Rovsing (79) Quinby (75) and others. One of the most carefully and critically studied groups of patients are those reported by

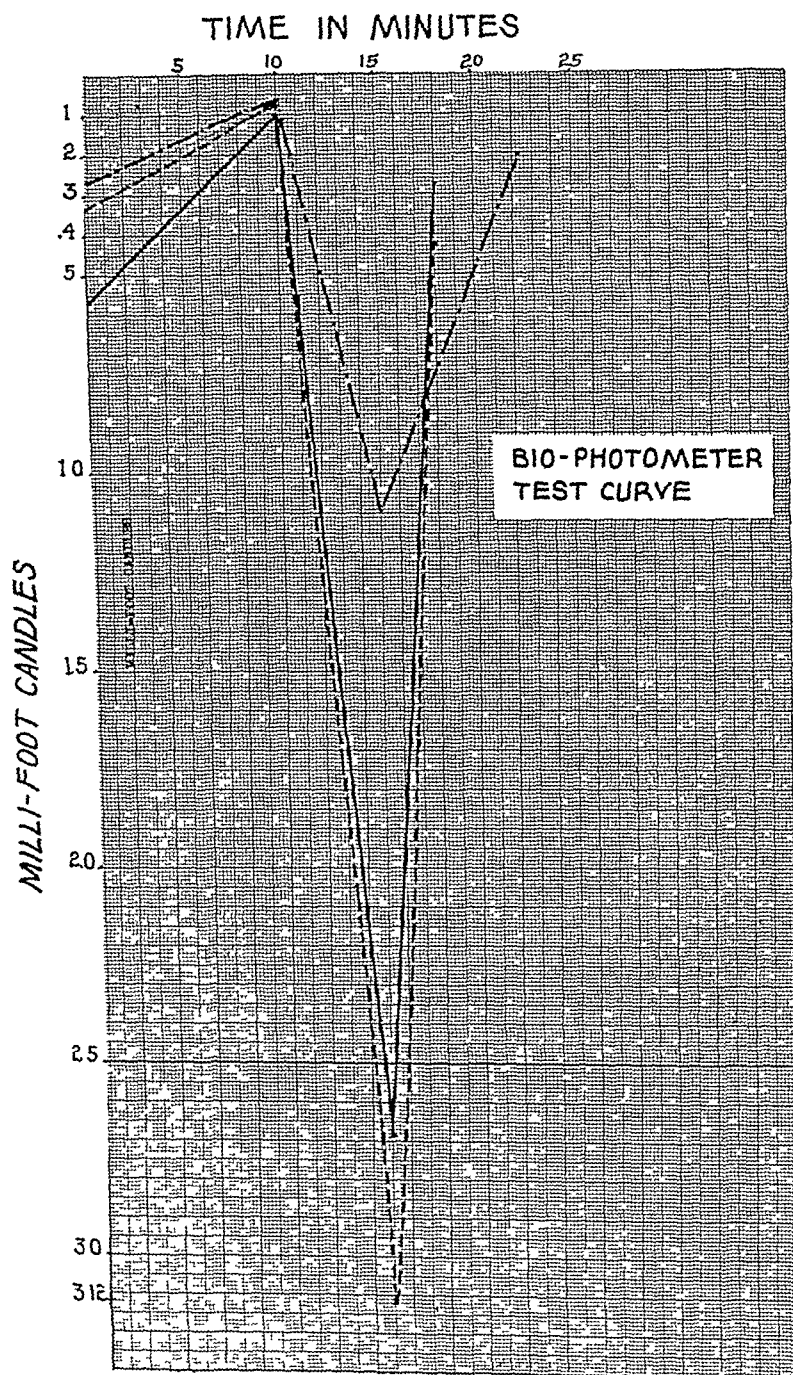


Fig. 2 Curve showing Vitamin-A deficiency in a patient with bilateral renal lithiasis and improvement following Vitamin-A therapy.

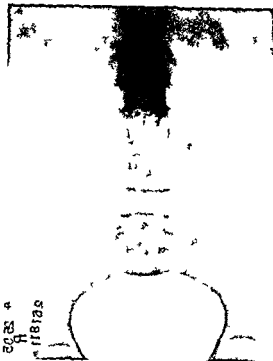


Fig. 3 Bilateral renal lithiasis as associated with hyperparathyroidism. An adenoma of the parathyroid gland was removed.

Bugbee His investigation was made to determine the presence or absence of pre-existing pyelonephritis as a possible factor in the formation of kidney stones. A definite history of pyelonephritis was elicited in 3 of 29 cases and in 17 patients treatment had been administered during the initial attack. In the remaining 6 cases other physicians had treated the infection. Although roentgenograms did not demonstrate the presence of a calculus at the time the patient was first seen, stones subsequently developed in all these patients.

Ten examples of renal stones due to the staphylococcus were reported by Boshamer (6) in 1932. Formation of these calculi is probably due to the ability of certain members of this group to decompose the urine with the resultant formation of ammonia, a reaction favorable to the precipitation of calcium salts.

Lett (59) in reviewing the bacteriological studies in 638 cases of urinary lithiasis found 73 instances in which the urine was sterile and in 3 additional cases the urine was found to be sterile at various examinations. Of 419 cases of renal

calculi the urine was sterile in 49 instances. In the classification of the organisms it was found that the staphylococcus albus was present in 314 cases, bacillus coli in 41 per cent, streptococcus in 13 per cent and bacillus proteus in 122 per cent. Runeberg (70) in 1935 stressed the importance of anaerobic organisms in the genesis of calculi.

Stones may be produced in animals by infecting them with specific stone-forming bacteria isolated from the urinary tract of a patient with rapidly growing or recurrent calculi. Hrvntschak (46) in 1935 injected cultures of the staphylococcus albus, bacillus coli, bacillus proteus and bacillus lactis aerogenes intramuscularly one week after partial obstruction of the ureter was produced by a silk ligature. In 80 per cent of these animals fine calcareous sand was found and in a few well-defined calculi. These occurred however following the injection of the staphylococcus albus and not following injection of the other organisms. Hager and Magath (35) have produced calculi by use of the bacillus proteus and Keyser (13) with streptococci.

It is evident therefore that careful classification of the offending organism is important not only from the standpoint of the therapy to be instituted but also from that of prognosis. In each case it should be determined whether the organism has the power of splitting urea with the resultant formation of ammonia and carbon dioxide. While reports in the literature indicate that the proteus group chiefly possesses this power, Brown and Earlam (20) have demonstrated that 18 per cent of the bacilli that infect the urinary tract have the property of splitting urea and 40 per cent of the strains of staphylococcus albus studied possessed similar properties. Therefore in all cases tests of urea-splitting properties should be determined (Figs. 4 and 5).

FOCAL INFECTION

Rosenow and Meisser (78) demonstrated the specificity of the streptococcus in the formation of urinary calculi. They inoculated the pulps of the teeth of 6 dogs with streptococci isolated from the urine of patients with urinary lithiasis. Following this calculi developed in the dogs and streptococci were again isolated from the urine. In view of this work, foci of infection in the teeth, tonsils, prostate, cervix and bowels should be evaluated.

STASIS

Uro stasis in certain instances seems definitely to be associated with the formation of renal calculi and frequently is conducive to shifting of

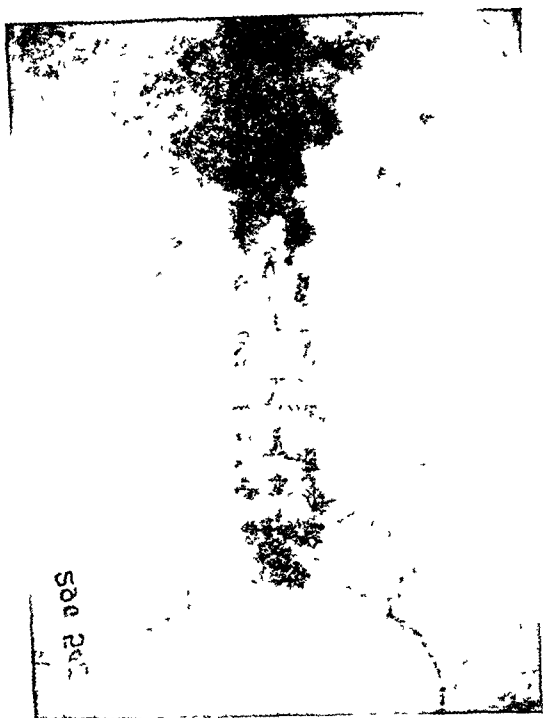


Fig 4 Staghorn calculus in the right kidney associated with a proteus infection



Fig 5 Staghorn stone in the right kidney with coexisting infection due to the staphylococcus albus which split the urea

the pH of the urine to the alkaline side. The observations of Hunner (48) emphasize the importance of ureteral stricture in the formation of stones in the kidney.

Bibus (5) states that mechanical factors are largely responsible for the formation of renal as well as vesical calculi. Disturbances of mobility and the presence of residual urine in the upper urinary tract are important factors. Bibus concluded that urinary infections also influence the formation of stones.

Stasis may be demonstrated by intravenous urographic studies which should be made prior to operation in order that the cause may be removed. They should be repeated again after operation before the patient is discharged from the hospital in order to ascertain that stasis has been eliminated. I believe this is an extremely important part of the routine in the decreasing of recurrences.

Snipper (84) believes that all factors which tend to stabilize labile colloids must help to prevent the formation of stones. The presence of salicylates, mandelates, hippurates, and other organic salts in the urine may, by increasing the

stability of the urinary colloids, exercise a prophylactic influence against the formation of stones. He concludes "Factors which may have a preventative or even a curative effect on the formation of renal calculi are

"1. Administration of foods with an acid-ash which increases the acidity of the urine and the solubility of the calcium salts

"2. Artificial acidosis by ingestion of ammonium chloride, ammonium nitrate, and other compounds

"3. Large supply of vitamin A"

Residues of kidney stones and urinary gravel may be prevented by these measures. However, it is evident that the presence of hippurates, salicylates, mandelates, and other organic salts in the urine must also be of great importance for the prevention of renal stones.

Caulk (15) in 1913 described a papillary lesion of the kidney reported by Opie as follows, "Sections preserved in 40 per cent formalin and decalcified with 5 per cent nitric acid. The section of the papilla with the incrustation showed that the tip of the papilla was covered with homogeneous material which took a deep blue stain of decal-

cified material. The tissue of the papilla was dense and fibrous and contained very few cells. The tissue in immediate contact with the mass had undergone hyaline degeneration. In this hyaline area as the calcified mass is approached numerous minute calcified granules are seen. Deeper in the substance of the papilla the tissue is loose in texture and contains numerous blood vessels. There are also collections of lymphoid cells. It was thought that this condition was due to a primary necrosis of the papilla with secondary depositions of calcium phosphate.

In 1937 Randall (76) following a series of investigative researches on renal calculi presented two postulates:

1. A renal calculus in the absence of pelvic obstruction would have to have an initiating lesion in order to grow.

2. Such a lesion would have to occur on the renal papilla.

In 1937 he (77) stated that calcium plaques in the renal papilla were observed in 140 of 609 cases in which post mortem studies were made. In this series of autopsies 49 renal papillae with stones adherent thereto were observed and in practically every instance the stone was growing from a deposit of calcium in the papillary wall. He states that the cause of this original observation awaits a thorough pathological study but one thing seems definite from the material available in 1936 infection *per se* was not observed in any of the lesions studied at that time.

METABOLIC DISTURBANCES

Metabolic diseases such as gout, permanent non-infected phosphaturia, ovaluria (the latter stated by Neville (66) to be associated with vitamin B deficiency) or cystinuria which is a disease of intermediate protein metabolism may be associated with the formation of calculi. Seeger and Kearns (81) collected a series of 181 cases of cystinuria and found 124 instances of renal lithiasis. Since that time numerous authors have reported similar findings. Thus a complete metabolic study is required in this particular group of cases.

Siddal (83) states that most of the calculi seen in southern China are composed of uric acid, urates and oxalates. In the rural districts where calculi are common the source of the water supply is from wells and this well water is extremely hard while in Canton where vesical calculi are not common the river water is the source of supply among the poorer classes.

From these clinical and experimental investigations it is apparent in view of our present knowl-

edge that many factors are associated with the formation of renal calculi. Therefore a comprehensive pre-operative investigation is essential in all cases of renal lithiasis and the factors associated with the formation of the stone in the individual case must be eradicated in order to avoid a recurrence (Fig. 6).

RECURRENT RENAL LITHIASIS

Herbst (37) classifies recurrent calculi into two groups:

1. True recurrences or new formations of a calculus after complete removal of the original stone.

2. False recurrences or the persistence of stones or fragments of a calculus which were overlooked at the time of operation.

In 1915 Cabot and Crabtree (13) in reviewing the results secured in the treatment of renal stones at the Massachusetts General Hospital stated:

Recurrence occurred in 56 per cent of patients treated by nephrotomy and 51 per cent of those treated by pyelotomy.

Brongersma (9) reported the incidence of recurrence to be about 16 per cent when slight or no infection was present in the kidney. When pronounced infection was present recurrence occurred in about 50 per cent of the cases.

Barney (4) in 1922 reviewed a series of cases from the Massachusetts General Hospital and reported the incidence of recurrence to be 32 per cent following removal of a calculus from the kidney. In this group a postoperative roentgenogram revealed that a stone was still present in the kidney in 9 of 20 cases or 45 per cent.

Braasch and Foulds (8) in 1924 stated that calculi recurred in 10.79 per cent of the patients who were operated upon at the Mayo Clinic. Herbst (37) noted an incidence of recurrence of 15 per cent while Hunner (49) in 1927 found that there was recurrence following 9.5 per cent of the operations for renal stones and 4.4 per cent for ureteral stones. Oppenheimer (68) published a paper in 1937 in which he cited the rates of true recurrence following pyelolithotomy, pyelonephrolithotomy and nephrolithotomy as 14.9 per cent, 32.0 per cent and 29.4 per cent respectively. He stated that conservatism should still be the desideratum in the primary treatment of unilateral calculous disease.

Forty-nine recurrences in Gezz Illyes (49a) were due to three factors:

1. Infection, the most important organism being the staphylococcus, the bacillus proteus and Friedländer's organism were also found frequently.

2 Retention in the kidney, especially if cavities were present

3 Diathesis which could be influenced by diet and modes of living

According to Douillet (25) the average recurrence following surgical removal of renal calculi is 27 per cent more frequent when infection is present than when the urine is sterile, and it is also more common after nephrotomy than after pyelotomy

Twinnem (88), in 1937, reviewed the results of 314 operations for stone which had been performed at the New York Hospital. The percentage of recurrence following nephrotomy was 28 per cent and following pyelotomy 20.9 per cent. However, during the past one and one-half years, the recurrence was reduced to 5.36 per cent.

Keyser (56) reported 28 cases of recurrent calculi, of which 16 were personal cases. He was able to interrupt the cycle of recurrence by removal of the existing calculi, acidification of the urine, removal of local and focal infection, repeated cystoscopic lavage, and ureteral dilations.

In the series of patients operated upon at the Cleveland Clinic, the incidence of recurrence from 1923 to 1932 was 16.4 per cent. Since that time, by use of the high Vitamin-A acid-ash or alkaline-ash diet which controls the pH of the urine, in addition to the other procedures employed in the past, the incidence of recurrence has been reduced to 4.9 per cent. A review of the last 100 cases of recurrent renal calculi that came to the Cleveland Clinic showed that the staphylococcus albus was the most frequently identified organism and then came the bacillus proteus. The recurrence developed most frequently during the first three years after operation in the group of unilateral cases, and during the first eight years in the bilateral cases. More striking was the observation that 223 operations were or had been performed on this group of cases of calculous disease, and that nephrectomy was or had been performed in 22 per cent.

Postoperative management, therefore, should consist of the elimination of stasis, eradication of local and focal infection, correction of deficiencies of Vitamins A and B if they be present, correction of metabolic errors, surgical treatment of hyperparathyroidism if it be present, and control of the pH of the urine from the kidney which harbored the calculus. The last is accomplished by dietary means, that is, the high Vitamin-A acid-ash or alkaline-ash diet, which depends on the chemical constituents of the calculus removed and the pH of the urine.

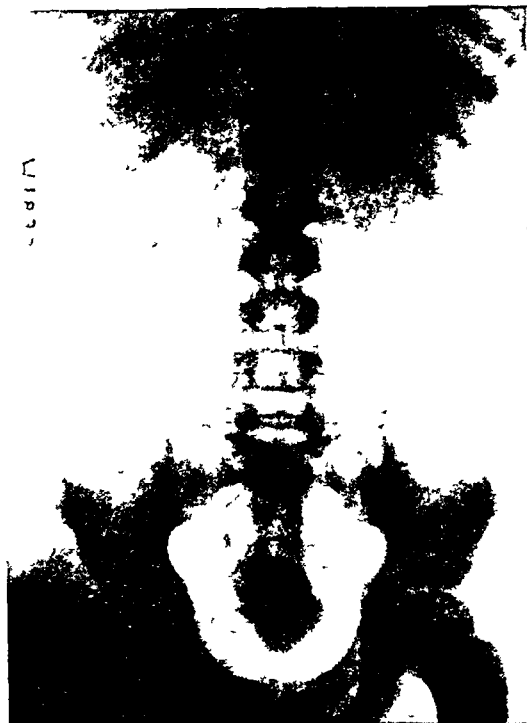


Fig 6 Calculus in the right kidney and 2 stones in the bladder. Examination postoperatively showed them to be composed of cystine.

FORMATION OF RENAL CALCULI IN PATIENTS WITH FRACTURES OR PROLONGED INFECTION

Since 1855, following Virchow's work, reports in the literature have given ample evidence of the association of urinary calculi and diseases of bone.

In 1937, in a review of the literature, I (43) observed that in only a few cases had an examination of the calculus been made to determine its chemical constituents. However, the stones that had been analyzed were found to be composed chiefly of calcium phosphate, oxalates occurred in the calculi in a few instances.

The prevention of the formation of calculi in patients with orthopedic conditions consists primarily in the maintenance of the pH of the urine on the acid side. This can be accomplished by the use of the high Vitamin-A acid-ash diet which maintains the pH of the urine at from 5.2 to 5.4. Extreme care should be exercised to avoid infection of the urinary tract if catheterization is required. As it is desirable to maintain an acid reaction of the urine, medication with alkaline substances should be avoided. If the patient is recumbent, the position should be changed fre-

quently if at all possible. In fractures of the spine associated with the retention of urine we believe that the use of Monroe's tidal drainage apparatus is preferable to overflow or frequent catheterization. If urinary infection is already present when the patient is first seen, frequent rechecks of the pH of the urine (cultures and smear of the sediment of the urine) and microscopic examination are essential. By such routine management the formation of calculi in this group of patients can be decreased.

Goldstein and Abeshouse (31) in 1935 reviewed the literature and added 14 additional cases. They mentioned the relationship between various chronic diseases of the bone and urinary lithiasis, placing emphasis on the proper dietary routine for patients with such conditions.

McCague (62) in discussing the clinical findings in 10 patients who were hospitalized because of trauma and in whom stones developed, stated that the average period in bed was five months while the interval elapsing between the time of injury and the diagnosis of calculous disease was twenty months. In 4 patients the stones were bilateral, in 4 unilateral, and in 2 vesical calculi were noted. He stated that one of the most important factors in the prevention of this type of calculus was acidification of the urine and maintenance of its pH between 4.9 and 5.2.

Pyrah and Fowweather (74) in 1938 discussed the problem of urinary calculi in recumbent patients and presented 7 cases. In preventing such formation of renal stones they instituted active movement and massage of the limbs not actually splinted. In addition they forced fluids, turned the patient frequently if possible, used the acid ash diet, administered Vitamin A, and controlled the bowel. They state, however, that the addition of the acid ash diet as a rational means of increasing the rate of disappearance of the stones and in their experience had proved extremely valuable.

BILATERAL RENAL CALCULI

Moeri (64) classifies bilateral renal calculi into three groups and states that they occurred in 13.9 per cent of his cases. When they are seen in cases of calculous anuria, he advises that the last organ involved is logically the better and should receive attention first. If there is a pyonephrosis and consequent destruction of the kidney, the opposite kidney should be operated upon first. If infection is present, however, the indications are more obscure and it is more difficult to reach a decision. Aseptic cases offer the best prognosis and it is better to treat the good kidney first.

Pugh (73) noted bilateral stones in 6 per cent of the children with renal lithiasis and in 17 per cent of the adults. He stresses that large bilateral calculi do not always require surgical intervention unless an emergency arises such as blockage of the outflow of urine.

Andre (2) in discussing the management of bilateral renal calculi stated that unless surgical intervention demands immediate attention, it is better to operate first upon the kidney with the least calculi, which generally is the better.

Hrynitschak (47) is of the opinion that bilateral renal calculi exert such a destructive action on the renal parenchyma that they should be removed surgically unless contraindications exist.

Twinnem (89) in reviewing the cases of bilateral renal lithiasis from Lowsley's Clinic is also of the opinion that in general the better kidney should be operated upon first in order that the patient have a better functioning kidney when the poorer one is operated upon. He stresses, however, that exceptions may arise especially when the condition of one kidney demands immediate attention.

Winsbury White (93) prefers to operate upon the better kidney first so that if at the time the second one is operated upon, some factor requiring nephrectomy seems to be present, it may easily be decided whether it is wise to remove the kidney after the one on the opposite side has actually been handled. In certain advanced cases in which both kidneys are the seat of large masses of stones, he believes a permanent nephrostomy is indicated.

In a review of the cases of renal lithiasis seen at the Mayo Clinic, Priestley (72) found that 14.8 per cent of the patients had bilateral involvement. According to this writer, the treatment to be instituted depends upon the number of calculi present, their size, the extent of renal damage, and the age of the patient. Treatment may be conservative or it may be necessary to institute radical operative procedures.

Stevens (85) states that conservative treatment may be advisable or a surgical attack may be made primarily on one or both sides, the procedure depending upon the individual case. He believes that one should not be blindly guided by rules but that the treatment instituted should depend upon a clear knowledge of the objectives sought (immediate and remote) of the means of attainment of these objectives and the risks involved.

Trschurtsch (90) believes that if operation is advised, pyelotomy is the procedure of choice; then comes nephrostomy. He believes operation is advisable when it is impossible to leave the kidney intact when danger to life can be averted.

by operation, and when constant incapacitating pain is present

Bibus (5) has said that the surgeon should choose for the operation neither the kidney which is in better condition nor that which is more diseased, on the basis of these facts alone. He is of the opinion that the kidney which endangers the life of the patient or which is itself in danger of destruction should be treated first.

From a review of the impressions of various authors, although various opinions are expressed, the consensus of opinion in general is that the better kidney should be operated upon first when surgical intervention is advisable. Obviously each patient must be individualized and treatment instituted which is warranted by a complete urological study in each case (Fig 7)

URETERAL CALCULI

Crance (20) removed 72 of 77 ureteral calculi without operation. His technique is to retain catheters in place twenty-four, forty-eight, and seventy-two hours. As the catheters are about to be removed, one is plugged (if two are in the ureter), sterile water is then gently injected into one ureter until the patient feels discomfort in the side. The catheter is then slowly withdrawn while the syringe for injection is held in the other hand. Frequently the calculus was passed within twenty-four hours following this procedure.

Dourmashkin (26) states that a fairly large stone in the upper or middle part of the ureter should be removed by open operation following two or three unsuccessful attempts to move it past the obstruction, even in the absence of infection or apparent drainage through a groove. With a stone in the upper two-thirds of the ureter, when the obstruction has been passed, and with improved renal function and subsidence of the infection, longer waiting is advisable. The value of intravenous urography in this group of cases is stressed.

Foley (29) believes that manipulation and expectancy have been advocated too extensively and that the morbidity, mortality, and hardship to the patient have been underestimated. Aptly he states that such methods are truly conservative only when they best serve the patient's welfare.

Thompson (86) stresses that the transvesical removal of a ureteral stone is not an office procedure but should be restricted to hospitalized patients. At the Mayo Clinic they have used for years the method described by Bumpus (12), who advocates employing several ureteral catheters which, after passing the calculus, are twisted to enmesh it in the coils that are produced. Thomp-



Fig 7 Bilateral renal lithiasis in which there was no associated renal infection

son states further that for the past few years he has utilized with satisfactory results the extractor described by Council (18). The successful extraction depends upon the presence of sufficient room to allow free passage of the instrument and easy manipulation.

According to Moore (65), the larger the stone the less likely are manipulative efforts to succeed. A stone in the lower third of the ureter is more amenable to manipulation than one higher in the ureter. If the stone is lodged in the middle or upper third of the ureter and is not more than 1 cm in diameter, one may wait until it comes down into the lower third of the pelvic portion before manipulation is undertaken. More important, if the calculus is more than 1 cm in diameter and if it seems probable that more than three cystoscopic treatments or ureteral dilations will be necessary before the stone is expelled, it is often less trying to the patient and possibly less hazardous to proceed immediately with extraperitoneal ureterolithotomy.

Emmett (27) classifies the manipulation of ureteral stones into two types.

1. The passive type, including the passage of ureteral catheters, dilatation of the ureter below

the stone with catheters or bulbs or the injection of lubricants of various kinds into the ureter below the stone

2 The active type including the passage of instruments which grasp the stone the passage of multiple catheters or the use of various stone extractors

Emmett believes that the passive type of manipulation is not difficult and seldom presents technical difficulties. It is also less effective unless the calculus is small and the patient is willing to endure several attacks of colic varying in intensity over varying periods of time until the stone is passed. The active type however is effective in a large percentage of cases if done skillfully and with great care. However serious complications may result if careful technique and the utmost gentleness is not used.

Jarman and Scott (50) reported a series of 27 consecutive cases of calculi in the ureter in 25 of which (92.5 per cent) the calculus was recovered after the passage of multiple catheters beyond the calculus followed by the injection of a 2 per cent solution of avertin. The solution is prepared by dissolving 1 gm of avertin crystals in 50 c cm of warm sterile distilled water. In 13 cases (48.1 per cent) the stone was recovered as soon as the patient voided.

A review of the literature shows that the numerous methods of transvesical extraction of stones that have been recommended indicate the ineffectiveness of any one method. Extractors should never be forced into the ureter gentleness of manipulation will prevent many complications. If as Moore has stated repeated manipulation which taxes the patient beyond endurance and may result in infection and chills and fever is necessary surgical intervention should be instituted. Perhaps no pathological condition in the urinary tract tries the clinical judgment of the surgeon more than a stone impacted in the ureter.

SURGICAL PROCEDURES

From a review of the literature it is apparent that most writers advocate the employment of *pyelolithotomy* in uncomplicated cases of renal calculus when it is feasible. It is not however necessary in all cases to *manhandle* the kidney and deliver it *well up into the incision*. By careful dissection and adequate exposure the kidney *pelvis* can be sufficiently exposed and the calculus removed the kidney being allowed to remain in its normal position. After removal of the stone and in the absence of pronounced infection the incision in the *pelvis* should be closed with *ooo*

plain catgut passed only through the outer coats of the pelvic wall.

When larger stones are present or a calculus occupies a position in a calyx with an associated stricture of the infundibulum *nephrolithotomy* may be advisable. It should however be as conservative as possible and it is preferable to pass a catheter into the pelvis and leave it there for irrigation and removal of clots which might be retained and act as nuclei for recurrent calculi.

Prather (71) has recommended a new approach for the removal of large calculi of the *staghorn* type. He advocates making a V shaped incision on the posterior surface of the kidney with the apex of the incision at the pelvis and the ends extending toward each pole and over the stone. With a small retractor lifting the flap of cortex the stone may be visualized and removed without fragmentation. The *nephrotomy* incision is closed with *oo* chromic catgut and a number 13 F Pezzer catheter is placed so that it emerges from the end of the incision at the lower pole. This is allowed to remain in place from fourteen to sixteen days. No secondary hemorrhages have occurred in Prather's cases. Occasionally technical difficulties may arise in the removal of a calculus from the kidney and require a *nephropielolithotomy* but in my hands it has seldom been necessary.

De Vincentis (24) discusses the divergence of opinion as to the relative advantages of the electric cutting current and those of the scalpel. He made functional and histological studies on a series of 36 rabbits employing a *nephrotomy* incision. After utilization of the cutting current the concentration of the urea in the blood rose more than when the scalpel was used and remained at a new level for approximately twelve days. In both types of incision there was increased elimination of urea in the urine. *Nephrotomy* with a scalpel was followed by death from hemorrhage in 3 rabbits on the second postoperative day. No deaths from postoperative hemorrhage occurred following *nephrotomy* when the cutting current was used. Microscopically the zone of hemorrhage in the *parenchyma* with reference to extension did not seem to differ. More important however was the fact that in the tissue incised with the cutting current there was extensive necrosis of the *parenchyma* of the kidney but in the tissue incised with the scalpel there was little necrosis and that was limited to the region of the incision. In tissue incised with the cutting current this necrosis was more extensive and extended beyond the line of incision. After twenty four days and still more com

pletely after one month, the degenerative process and zones of necrosis had disappeared from the kidney incised with the scalpel, whereas in the instances in which the cutting current was used, degeneration and necrosis were still present, although to a less degree, throughout the entire period of observation, which was two months) De Vincentis concluded that the kidney is extremely sensitive to the electric cutting current.

Counseller and Hoerner (19), in reviewing the results in cases in which nephrostomy was employed, stated that if the kidney is found to be rather extensively damaged and the seat of rather marked infection at the time of operation, it frequently is advisable to insert a nephrostomy tube, preferably through the lower calyx, to aid rehabilitation of the kidney. This permits not only excellent drainage but also direct lavage of the kidney as often as is desired. These writers report that gratifying results are frequently noted in restoration of function and eradication of infection following nephrostomy.

In a selected series of cases of renal lithiasis heminephrectomy may be a desirable procedure. The suitable cases are those with a calculus in a dilated, infected hydrocalyx at the upper or lower pole of the kidney containing a calculus. Even if the calculus is removed by a small localized nephrolithotomy, the infection may persist and eventually destroy the kidney. This is true especially when there is a coexisting stricture of the infundibulum.

In recent years, conservatism has become the byword in the treatment of renal calculi, especially since by a carefully planned postoperative routine recurrent calculi are steadily reduced.

In 1936 Shaw (82) reported on 4 cases in which vaginal ureterolithotomy was done and mentioned that, inasmuch as this procedure carries only a slight degree of shock, it may be performed on extremely ill patients. Higgins (41), in 1937, reported on 11 cases treated by vaginal ureterolithotomy and stated that this procedure offered a simple method for removal of a calculus impacted in the lower end of the ureter. In view of the absence of postoperative reactions, this technique may be employed in extremely ill patients in whom other surgical procedures would be attended by a high mortality. Furthermore the period of convalescence is shortened.

In 1932 Mann and Israel (61) cited 2 cases in which vaginal ureterolithotomy was performed. Hicks and Maris (38) also reported 2 cases, pointing out the possibility of the formation of fistulas. In a review of the cases reported in the literature, I have been unable to note the occurrence of this

complication. With careful selection of patients, this is an invaluable surgical procedure, and patients critically ill, who I believe would have died from any other surgical procedure, have survived. No fistula occurred in any of our cases.

Thompson (87) in 1936 stated that during the past four years 161 patients with vesical calculi had been treated by conservative transurethral methods at the Mayo Clinic. In the past a considerable amount of hypertrophied prostatic tissue had always been deemed a contraindication to litholapaxy. Thompson believes, as a general rule, that it is best to crush the stone prior to prostatic resection, but if the lithotrite cannot be passed easily beyond the prostatic enlargement, it may be necessary to perform a transurethral resection of the prostate first. He reports cases in which he crushed and removed large calculi and performed a transurethral resection under the same anesthesia. This is undoubtedly the best procedure because, as a general rule, the vesical calculi can be crushed quite rapidly, and sufficient time is allowed for the prostatic resection. In general there seems to be a return to the more frequent use of the lithotrite in the removal of bladder stones. Again, however, it is not free from danger and complications, and individualization of the patient is essential. Hamer and Dykhuizen (36) believe from their observations of 22 cases that the treatment frequently depends upon co-existing conditions. The frequency with which hypertrophy of the prostate is present makes the treatment of this condition of primary importance. In their opinion, transurethral resection is also a satisfactory method of treatment for evacuation of a subcervical nest of small calculi.

Lazarus and Rosenthal (58) reported 15 cases of prostatic calculi, stating that the treatment depends upon the symptoms. If the patient was free from symptoms, diathermy and massage were recommended, suprapubic prostatectomy being recommended when an adenoma was associated with calculi. In 1934 Young (94) presented his findings in prostatic calculi. He believes the treatment varies with the individual case. If there are no symptoms, the prostatic secretion and urine are sterile, and sexual power is normal, operative treatment is not advised and frequently no local treatment is given. When pronounced symptoms are present, surgical removal is recommended. If possible in this group, perineal prostatolithotomy was recommended. The ideal operation according to Young is removal of the calculi without opening of the urinary tract.

Cahill (14), in discussing the problem of calculus anuria, the condition that accompanies the

the stone with catheters or bulbs or the injection of lubricants of various kinds into the ureter below the stone

2 The active type including the passage of instruments which grasp the stone the passage of multiple catheters or the use of various stone extractors

Emmett believes that the passive type of manipulation is not difficult and seldom presents technical difficulties. It is also less effective unless the calculus is small and the patient is willing to endure several attacks of colic varying in intensity over varying periods of time until the stone is passed. The active type however is effective in a large percentage of cases if done skillfully and with great care. However serious complications may result if careful technique and the utmost gentleness is not used.

Jarman and Scott (50) reported a series of 27 consecutive cases of calculi in the ureter in 25 of which (92.5 per cent) the calculus was recovered after the passage of multiple catheters beyond the calculus followed by the injection of a 2 per cent solution of avertin. The solution is prepared by dissolving 1 gm. of avertin crystals in 50 c.c. of warm sterile distilled water. In 13 cases (48.1 per cent) the stone was recovered as soon as the patient voided.

A review of the literature shows that the numerous methods of transvesical extraction of stones that have been recommended indicate the ineffectiveness of any one method. Extractors should never be forced into the ureter; gentleness of manipulation will prevent many complications. If as Moore has stated repeated manipulation which taxes the patient beyond endurance and may result in infection and chills and fever is necessary surgical intervention should be instituted. Perhaps no pathological condition in the urinary tract tries the clinical judgment of the surgeon more than a stone impacted in the ureter.

SURGICAL PROCEDURES

From a review of the literature it is apparent that most writers advocate the employment of pelviolithotomy in uncomplicated cases of renal calculus when it is feasible. It is not however necessary in all cases to manhandle the kidney and deliver it well up into the incision. By careful dissection and adequate exposure the kidney pelvis can be sufficiently exposed and the calculus removed the kidney being allowed to remain in its normal position. After removal of the stone and in the absence of pronounced infection the incision in the pelvis should be closed with ooo

plain catgut passed only through the outer coats of the pelvic wall.

When larger stones are present or a calculus occupies a position in a calyx with an associated stricture of the infundibulum nephrolithotomy may be advisable. It should however be as conservative as possible and it is preferable to pass a catheter into the pelvis and leave it there for irrigation and removal of clots which might be retained and act as nuclei for recurrent calculi.

Prather (71) has recommended a new approach for the removal of large calculi of the sigmoid type. He advocates making a V shaped incision on the posterior surface of the kidney, with the apex of the incision at the pelvis and the ends extending toward each pole and over the stone. With a small retractor lifting the flap of cortex the stone may be visualized and removed without fragmentation. The nephrotomy incision is closed with ooo chromic catgut and a number 18 F Pezzer catheter is placed so that it emerges from the end of the incision at the lower pole. This is allowed to remain in place from fourteen to sixteen days. No secondary hemorrhages have occurred in Prather's cases. Occasionally technical difficulties may arise in the removal of a calculus from the kidney and require a nephropelviolithotomy but in my hands it has seldom been necessary.

De Vincentis (24) discusses the divergence of opinion as to the relative advantages of the electric cutting current and those of the scalpel. He made functional and histological studies on a series of 6 rabbits employing a nephrotomy incision. After utilization of the cutting current the concentration of the urea in the blood rose more than when the scalpel was used and remained at a new level for approximately twelve days. In both types of incision there was increased elimination of urea in the urine. Nephrotomy with a scalpel was followed by death from hemorrhage in 3 rabbits on the second post-operative day. No deaths from postoperative hemorrhage occurred following nephrotomy when the cutting current was used. Microscopically the zone of hemorrhage in the parenchyma with reference to extension did not seem to differ. More important however was the fact that in the tissue incised with the cutting current there was extensive necrosis of the parenchyma of the kidney but in the tissue incised with the scalpel there was little necrosis and that was limited to the region of the incision. In tissue incised with the cutting current this necrosis was more extensive and extended beyond the line of incision. After twenty four days and still more com-

7 Close follow-up for three years, which is the maximum period of formation of recurrent calculus, is essential

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suppression of urine caused by stones in the kidney or ureter states that it occurs

1 When 2 secreting kidneys both have ureters or pelvis which are blocked simultaneously or one following the other

2 When a solitary secreting kidney is blocked the other having been destroyed by disease previously removed or imperfectly developed

3 When both kidneys or a double kidney has a fused ureter blocked by a calculus

4 When 1 of 2 kidneys which are apparently normal is blocked by a calculus renorenal reflex stopping the secretion from the opposite kidney

Cahill in a comprehensive study of 22 cases stated that cystoscopic examination in conjunction with retrograde pyelography was the most important diagnostic procedure. His first step in the treatment of calculous anuria was the relief of obstruction. The forcing of fluids subcutaneously or intravenously with a solution of dextrose of varying concentrations was of value in aiding the return of renal secretion. If secondary anemia was present in patients with infection the renal output increased rapidly as the blood volume was restored to normal. In some cases restoration of the renal secretion followed transfusion. In cases in which there was no coexisting infection there was a rapid secretion of urine and elimination of the retained urea from the blood when infection was present secretion often did not start from twenty four to forty eight hours after nephrostomy. The relief of obstruction forcing of fluids (dextrose) intravenously and transfusions are therefore of prime importance in the treatment other medication being administered as indicated by the blood chemistry findings.

In 1937 (42) the present status of the dietary regimen in the management of urinary lithiasis was discussed by the author. A preliminary report of the results at that time showed the dietary regimen to be most applicable (1) in the prevention of recurrent renal lithiasis (2) in the prevention of the formation of urinary calculi in patients with orthopedic conditions and (3) in the prevention of the formation of calculi in patients who pass stones at frequent intervals but in whom a calculus is not demonstrable in the kidney.

Solution of a cystine calculus by strong alkalization of the urine was described by Crowell (21) while Keyser (57) in 1933 reported partial solution of a carbonate stone. Vrah and Fow weather (74) reported 2 cases of renal lithiasis in which the stones were dissolved in 1 instance large bilateral renal calculi disappeared.

It has previously been stated that a calculus in the kidney should not be treated by dietary

means if it is producing obstruction thereby impairing renal function. Also the diet should not be prescribed if a coexisting infection which cannot be eradicated is present and it is obvious if the pH of the urine cannot be controlled no results can be anticipated. In spite of this case reports have been presented in which a calculus in the kidney with a coexisting proteus infection has been treated by the acid ash diet and acidifying agents. As the pH of the urine cannot be controlled by either such treatment is contraindicated as well as the use of ammonium chloride as discussed by Chute (16).

In a collected series of 3 cases spontaneous solution occurred but as only few cases meet the requisites stated when this treatment is advocated usually only a case report is available.

Braasch (8) in 1938 in discussing blood calcium phosphorus and phosphate studies in urinary lithiasis mentioned 2 cases in which 2 recently formed calculi were dissolved by acidifying drugs. Obviously again indiscriminate use of the acid ash or alkaline ash diet in the medical treatment of renal lithiasis is to be avoided. In 2 instances large renal calculi underwent fragmentation and decrease in size but complete solution did not occur.

In patients with bilateral renal calculi which frequently are associated with infection the results have not been satisfactory. Therefore treatment of the renal calculi by medical means is recommended in only a limited group.

CONCLUSIONS

1 From a review of the literature it is apparent that intensive pre operative investigation to ascertain the etiological factors associated with the formation of the calculus is essential.

2 A diligent postoperative routine is required to prevent the formation of recurrent calculi.

3 Conservatism in surgical treatment is advisable.

4 The application of the high Vitamin A acid ash or alkaline ash diet is of value in the prevention of recurrent calculi in the prevention of the formation of calculi in patients with orthopedic conditions and in those who pass calculi at frequent intervals but in whom calculi are not present in the kidney.

5 The high Vitamin A acid ash or alkaline ash diet is also of value in the solution of calculi in a selected group of patients.

6 Complete bacteriological study of the organism present in many cases of lithiasis is essential in order that proper medication may be prescribed for eradication of the infection.

of a hydronephrotic condition with tuberculous pyelitis. The great decrease in the volume of the kidney was related to the lapse of time during which the renal process began and then evolved after closure of the ureter. The multiple small foci of calcification were due to a secondary precipitation of calcium in an alkaline medium. These findings and the presence of numerous zones of ossification in contact with the calcified zones showed that the process was spent and in a state of advanced sclerotization.

Although the possibility of spontaneous cure in these forms of renal tuberculosis cannot be disregarded theoretically, it must be considered as very exceptional in practice, therefore, nephrectomy is the only justifiable treatment.

RICHARD KEMEL, M D

Soloway, H. M.: Renal Tumors. A Review of 130 Cases. *J Urol*, 1938, 40 477

The author reports 130 cases of renal tumor, 90 of which were operative, and 40 were found at autopsy. He discusses the symptomatology and pathology of these growths in detail. From his analysis, he found that in 70 per cent of these cases the hypernephroma carcinoma was found. This tumor has a tendency to invade the renal vein and vena cava, because of its low progressive growth and its tendency toward hematogenous metastases it is frequently first diagnosed by the finding of metastases in the lungs and bones. It is therefore apparent that these tumors are discovered rather late, which accounts for the low percentage of good results. Soloway further advocates earlier complete urological studies to bring these growths to light prior to the formation of metastases, which were found in 93 per cent of the autopsies and in 15 per cent of the operative cases.

In these cases, nephro-ureterectomy and even sectioning of a portion of the bladder is justifiable. Although the author states that the actual benefit of x-ray and radium therapy in the treatment of these tumors is debatable, he nevertheless advocates their use. He emphasizes the need for a universal classification of neoplasms based on histological structure.

J SIDNEY RITTER, M D

Howard, H. H., and Suby, H. I.: Perirenal Fibrosarcoma. *J Urol*, 1938, 40 491

True perirenal tumors may be one of two main types: (1) lipoblastomas, or (2) fibroblastomas, either benign or malignant. Tumors arising from the renal capsule are extremely rare, as are also the fibrosarcomas arising from the renal capsule, but the latter have been recognized and described for many years. These tumors may be very small, or they may become extremely large. This tendency to become very large seems to be one of their characteristic features. The abdominal mass may be the first sign noticed by the patient.

The case reported is that of a sixty-eight-year-old white man, whose chief complaint was weakness and loss of weight. For a year there was slight distress in the upper abdomen, and although the appetite

was good, there was "not enough room" for a normal-sized meal. There was nocturia for several years, but no frequency, nor bloody or cloudy urine. Physical examination revealed a large firm irregular non-tender mass easily palpable in the left upper quadrant, which did not move with respiration. The non-protein nitrogen was 44, and the excretion of phthalein was 25 per cent in the first hour and 23 per cent in the second hour. A plain urogram showed a soft tissue mass in the left upper quadrant with some calcification in its upper border. The right pyelogram was normal, but the ureter was tortuous and slightly dilated. A left pyelogram showed multiple areas of calcification in the upper left quadrant with a large soft tissue mass in the kidney region. The pelvis and calyces were displaced upward and flattened, and the upper ureter was displaced to the midline. Intravenous indigo-carmin appeared in four minutes on both sides with equal concentration. At operation, the tumor was exposed extraperitoneally and a mass the size of a football was removed.

The gross specimen consisted of a large roughly ovoid mass, measuring 27 by 12 by 10 cm and weighing 1,840 gm. The outer surface was slightly lobulated, yellowish, and smooth, and at the upper pole was covered with fat. Near the lower pole there was a soft, irregular hemorrhagic mass, softer than the rest of the mass, which was uniformly hard. The cut surface presented near the upper pole a kidney of normal size and appearance. This was unattached to the capsule, which was continuous with the mass. The mass extended for the most part below the kidney, and presented a hard, grayish-white surface with many white streaks and grayish-yellow irregular areas. The microscopic diagnosis was fibrosarcoma.

After three or four months, the patient again had pain and discomfort and a swelling in the upper left quadrant. Physical examination revealed a pallid definitely cachectic man, dry and uncomfortable. Palpation disclosed a large irregular mass filling the left upper quadrant, left flank, and extending medially to the umbilicus. The diagnosis was recurrent fibrosarcoma of the left flank. The urine contained a trace of albumin with some erythrocytes. There was a marked anemia and the non-protein nitrogen ranged between 30 and 46. The phthalein test showed an excretion of 25 per cent in two hours. High voltage x-ray therapy was started, but the patient's condition steadily became worse and he died.

At necropsy, a large irregular mass adherent to the parietal peritoneum was found filling the entire abdominal cavity except the right flank. The spleen was surrounded by tumor nodules attached to the main mass. The tumor was firmly adherent to the left leaf of the diaphragm and weighed 7,100 gm. The microscopic diagnosis was fibrosarcoma.

Sarcomas of the renal capsule present difficult diagnostic and therapeutic problems because they do not infiltrate and erode the renal pelvis and be-

GENITO-URINARY SURGERY

ADRENAL KIDNEY AND URETER

Walters W. and Kepler E. J. Surgical Lesions of the Adrenal Glands *J Am Med Ass* 1938 111 1061

Symptoms produced by a tumor of the adrenal cortex vary with the sex and age of the patient. These tumors occur most frequently in women in whom they produce variable changes in secondary sex characters such as cessation of menstruation, hypertrophy of the clitoris, atrophy of the breasts, excessive growth of hair on the face and body, and a florid complexion with acne and purplish striations of the skin. In girls tumors of the adrenal cortex tend to produce precocious puberty, more masculine than feminine in type. These tumors seldom occur in males. They produce precocious puberty of the masculine type in boys and feminism in adult males. Similar clinical pictures result from hyperplasia of the adrenal cortices, tumors of the gonads, or Cushing's disease. Routine laboratory studies have been of little aid in differential diagnosis, although a high content of estrogenic substance in the urine suggests adrenal cortical carcinoma, provided that pregnancy is excluded. Roentgenograms made after the injection of air into the perirenal fascial space aid in the localization of some adrenal tumors. In 40 cases of operation for adrenal cortical tumor the mortality rate was approximately 50 per cent. Walters and Kepler attribute the absence of mortality in 7 consecutive cases in which operation was performed at the Mayo Clinic to improved methods in the treatment of postoperative acute adrenal insufficiency. These consist primarily in the administration of large quantities of sodium chloride and sodium citrate, the daily administration of cortical hormone, and the use of a diet that is low in potassium throughout the postoperative period.

The most important adrenal medullary tumor is benign and produces attacks of paroxysmal hypertension. Operation was performed at the Mayo Clinic on 3 of 4 patients with this type of tumor and the results were excellent.

In the authors' experience the most accurate surgical approach to the adrenal glands has been through retroperitoneal and posterolumbar incisions.

Citrillo N. Some Cases of Closed Renal Tuberculosis (Sopra alcuni casi di tubercolosi chiusa del rene) *Prat Chir* 1938 5 79

By the term "closed forms of renal tuberculosis" the author includes only those forms which are secondary to closure of the ureter and are relatively rare when compared to the more common ulcerative and open forms. These closed forms present two main aspects: one a lumbar or abdominal tumor and the other no tumor but atrophy of the organ; this difference in aspect depends upon whether the closure

of the ureter occurs early or slowly and relatively late.

Various classifications of the aspects assumed by closed renal tuberculosis have been proposed, the best being that given by Tarozzi. Practically all authors agree nowadays that renal tuberculosis is in the largest number of cases secondary to local extension of the specific process elsewhere and is of hematogenous origin, but the debate on the manner of production of the morbid phenomenon is still going on. It is generally claimed that the most frequent primary localization is in the papillae, and the observations of Tarozzi show that this site is the most favorable for the subsequent diffusion of the process and for its evolution toward the more common ulcerative form. According to many, urinary tuberculosis occurs generally at the beginning of all forms of chronic renal tuberculosis. Surgical statistics show that usually renal tuberculosis is unilateral.

Tarozzi's classification includes the various forms in which renal tuberculosis may be found: (1) milary or acute hematogenous tuberculosis, (2) nodular or tuberculous tuberculosis, or tuberculosis with a renal caseous focus, (3) ulcerative tuberculosis, and (4) the properly called closed tuberculosis, which is derived on occlusion of the ureter from ulcerative tuberculosis. Closed tuberculosis may be subdivided into (a) pure tuberculous hydronephrosis, which is very rare, (b) hydronephrosis with tuberculous or caseous pyelitis, which includes the improperly called tuberculous pyonephrosis, and (c) massive kidney representing the late aspect of the preceding form.

The author discusses 4 typical cases in which nephrectomy was performed. The changes found in the first case showed that the condition was an advanced hydronephrosis with tuberculous pyelitis in which the closure of the ureter occurred at its junction with the renal pelvis. The histological findings aroused the suspicion that the tuberculous process was not spent. In the second case also the hydronephrosis must have immediately followed the closure of the ureter before the ulcerative or caseous destruction of the renal tissue was far advanced. Roentgenography raised the question of the presence of a calculus, but pyelographic examination and meatoscopy, which revealed a typical specific perimeatal lesion, cleared up the diagnosis.

In the third case the closure of the ureter had occurred later than that of the calyces and the content of the upper half of the kidney consisted of caseous, milky white material, while that of the lower half resembled the turbid albuminous liquid found in the first 2 cases. This patient had spontaneous and induced pain in the region of the kidney, and roentgenological examination revealed a difference in density between the upper and lower halves of the tumor.

The fourth case had all the characteristics of a typical massive kidney and was considered the result

in poor health and had unhealed sinuses and no bladder control, 8 were dead, 4 having died within a year. Six (16.6 per cent) of the 36 microscopic examinations of tissue removed showed carcinoma.

The author emphasized the need for improved postoperative care, closer supervision of and by the surgical and nursing staff, and more conservatism in the management of bad risks in public wards. Their statistics revealed an alarming morbidity and some unsatisfactory results. An important factor in reduction of the mortality rate at the Newcastle Hospital was the adoption of perineal prostatectomy when indicated. Hamilton stated that the challenge of an over-high mortality was still with us. It can and should be met. A lower mortality in public hospitals where a large percentage of the patients are bad risks seems possible only by the increased use of transurethral resection in the hands of a highly skilled surgeon. L. W. RIBA, M.D.

McDonald, S., Jr. Observations on Chorio-Epithelioma Testis, with Record of a Case. *Am J Cancer*, 1938, 34, 1.

According to Ross, writing in 1932, some 131 cases of chorio-epithelioma testis had been published up to that time. In a survey of the literature since that date, McDonald encountered records of 11 additional cases. He gives brief abstracts of the following authors' cases: Storjohann (1932), Welchman (1933), Montpellier and Herlant (1933), Laetsch (1933), Videla and his associates (1935), Entwistle and Hepp (1935), 2 cases of Levi-Valensi *et al* (1935), and 2 cases of Fortner and Owen (1935).

McDonald's case was that of a young man, aged twenty-four, with a swelling of the right testicle following an injury to this organ. He had noticed the enlargement two months before, and up to within two weeks of entering the hospital the enlargement had been painless. The growth had increased in size steadily. The right testicle was three times the normal size, and the growth was a hard, nodular, pear-shaped mass of uniform consistency. There was no enlargement of the regional lymph nodes. A diagnosis of teratoma was made, and the testis and cord up to the inguinal canal were removed. The pathological diagnosis was teratoma with epitheliomatous elements. The Aschheim-Zondek reaction was positive eleven days after orchidectomy. A quantitative Aschheim-Zondek test, made approximately six weeks later, showed 30,000 mouse units per liter. Approximately three months following the operation the patient began to show signs of metastases. He had considerable enlargement of the breasts, bilateral exophthalmos, wasting of the musculature of both lower limbs, and a small plum-colored, subcutaneous nodule on the tip of the right shoulder. The right kidney was palpable and enlarged. There was polyuria. X-ray examination showed widespread nodular metastatic deposits in both lungs. The patient died approximately three and a half months after the orchidectomy. The anatomical diagnosis following autopsy was generalized metastatic chorio-

epithelioma testis. The breast tissue showed hyperplasia of the ducts and edema of the periductal connective tissue, attended by round-cell infiltration.

The author then reviews the literature on the histogenesis of this type of tumor. In the discussion regarding the histogenesis he says: "However, even without taking into consideration the evidence afforded by endocrine considerations, no convincing arguments against the morphological identity of chorioepithelioma testis with uterine chorioepithelioma have, in my opinion, been put forward. Such arguments are based mainly on cases similar to those described by Taylor (1910) and Ross (1932) wherein adenocarcinomatous elements have been present in either primary or secondary chorioepithelioma testis. As will be seen below, the existence of such cases is by no means inconsistent with the trophoblastic nature of these primary growths of the testis which are wholly or partially identical with the typical Marchand chorioepithelioma."

"On referring to the communications of Ross (1932) and Seror (1935), it would appear that those who uphold the teratomatous origin of chorioepithelioma testis fall into two distinct groups. One of these follows the opinion expressed by Marchand (1903), who considered that the ectoderm of a teratoma, no matter what view is taken of its origin, may possess the power to produce tissue similar to the ectoderm of a normal ovum, without necessarily involving the formation of true fetal membranes as postulated by Schlagenhauser. On the other hand, it is held by some observers that the tumour arises as the result of some unknown stimulus applied to cells derived from the abnormal migration and arrest of totipotent blastomeres, which under the given stimulus may differentiate into ectodermal structures either as carcinoma or chorioepithelioma or both."

"In support of the theory of dislocated totipotent blastomeres a case reported by Ritchie (1903) may be cited. A cystic tumour of the anterior mediastinum in a man of twenty-four was found to consist of (a) a typical dermoid cyst and (b) chorioepithelioma developing in connection with a portion of the cyst wall. Furthermore, Hamdi (1934) has described what he considers to be typical chorionic epithelium in such widely differing sites as the wall of a subcutaneous dermoid cyst, the tunica albuginea testis, and a 'branchioma' originating in a thyroid rest."

"I would therefore suggest that if one assumes the origin of a testicular teratoma to be dependent on the presence of undifferentiated totipotent cells, the latter may form (1) an embryoma of 'adult' type characterised by the presence of rudimentary organs or (2) an undifferentiated tridermal embryoma in which attempts at organ formation are lacking. In either case, and particularly as regards the second, it seems reasonable to suppose that there are latent rests of the original totipotent cell from which may arise (a) adenocarcinoma, (b) large round-cell embryonal carcinoma (seminoma), and (c) chorioepithelioma or any combination of these. In theory the morphologic form which the tumour will assume de-

cause their position is hidden. Hence the abdominal mass may be the first symptom. Gastrointestinal disturbances (distress, food intolerance and vomiting) may be a striking part of the picture. Iam may be a prominent feature, whereas toxic symptoms (fever, weakness and weight loss) may be the first sign of disease. Urinalyses are usually negative. Ptelegrams occasionally are negative but usually show an obliterated renal shadow, a pressure defect of the renal pelvis and especially rotation of the kidney. Several cases reported showed calcification in the tumor. At operation the mass may or may not be encapsulated.

Recurrences after operation are the rule. Secondary operations are of no avail. It seems that immediate x-ray therapy should be instituted. The authors believe that a diagnosis should be made without exploratory operation. LOUIS NEUWELT M.D.

BLADDER URETHRA AND PENIS

Gray J. An Investigation into the Condition of the Bladder Mucosa in Relation to Stone Formation. *Brit J Surg* 1938 26 259.

In China calculosis of the urinary tract most commonly involves the bladder. This may be explained at least partly by a lack of x-ray and other facilities for thorough investigation. The author draws attention to the similarity in the localization of the stone in experimentally produced calculosis in rats fed with diets deficient in Vitamin A. Most workers have found that with such diets stones tend to form earlier and more often in the bladder than in the kidneys. An attempt is made to correlate this observation with a histological investigation of the bladder mucosa in experimental animals and in patients with calculus.

The author has carried out such a histological examination on the epithelium of the urinary tract in rats on a Vitamin A deficiency diet and has found characteristic changes. In the early stage there is a marked hyperplasia and often active mitosis in the cells of the deeper layers. Later the epithelium undergoes metaplasia of the squamous type and in the last stages marked degrees of keratinization are present. The changes occur first in the bladder, especially at the base and around the internal meatus. The fundus may show slight changes or even no change at all when the involvement is marked at the vesical orifice. Changes also occur in the ureters and kidneys but appear later so that when the bladder is involved the renal pelvis may still be normal. When the deficiency diet is carried on for a long period the changes are widespread through the urinary tract and so intense as to resemble carcinoma but this condition could never be produced experimentally. This may be true because it is difficult to keep the animals alive long enough on such a severely restricted diet.

To answer the question of the possibility of a relationship between a Vitamin A deficiency diet and the condition of an individual a study of the

vesical mucosa obtained by biopsy during operation was made. Although clinically skin conditions due to Vitamin A deficiency are frequently seen patients on such diets seldom if ever have any evidence of urinary calculus. On the other hand patients with urinary calculus particularly children more often than not have a remarkably clear skin with no hyperkeratosis and it has not been possible in most cases to discover that their diet suggested a Vitamin A deficiency. Of 11 cases studied 7 showed obvious alteration of the mucosa of the squamous type and 4 showed keratinization. The changes are comparable to those found in experimental animals but are never so intense. Both grossly and cystoscopically there was nothing pathological in the mucosa—certainly no leucoplakia or malacoplakia. In vital staining procedures revealed no lesion cystoscopically. In a few cases of nephrectomy for stone the epithelium of the renal pelvis showed no abnormality. With regard to the question of severe urinary infection as a causative factor it may be said that the majority of the patients were infected but a few had sterile urine particularly children. Furthermore in the experimentally produced condition if the animals were kept in sterile cages the urine did not become infected until quite late. The mucosal changes and often the stones as well were already present. However even in the experimental animals stones were sometimes found before the more extreme changes had occurred and in the final stages stones were practically always present. It was found in practice that the addition of an excess of Vitamin D to the diet accelerated the formation of stones.

It seems reasonable to suppose that in the presence of such gross alteration in the integrity of the bladder epithelium the formation of a urinary calculus would be facilitated particularly if the urine were already supersaturated with stone-forming substances.

LOUIS NEUWELT M.D.

GENITAL ORGANS

Hamilton T. The Surgical Treatment of Prostatic Obstruction. A Nine Year Review from the Newcastle Hospital. *Australasian & New Zealand J Surg* 1938 8 156.

The author reviews the results of 68 open surgical operations (14 suprapubic and 54 perineal) performed by a special organized group of general surgeons at the Newcastle Hospital over a nine year period. With combined effort and favor of the perineal approach the previous mortality of 27 per cent was reduced to 19 per cent. The average number of hospital days per patient was sixty-eight. Ten patients (14.7 per cent) had to be re-limited on account of recurrent obstruction, fistulas and incontinence. Follow up replies from 33 of 45 patients discharged from the hospital as clinically cured revealed the following: 14 (39 per cent) considered themselves entirely well, 4 (12 per cent) were well but had slight incontinence, 7 (18.6 per cent) were

FRACTURES OF THE NECK OF THE FEMUR

Five Year Collective Review

JAMES J. CALLAHAN, M.D., F.A.C.S., Chicago, Illinois

IN THE past five years there have been over 200 articles written on fractured neck of the femur. A review of this literature shows all the phases and intricacies of treatment, the mortality, and the end-results. There are three schools of thought, each favoring a different type of treatment. One is in favor of the plaster-of-Paris spica, another, in favor of closed internal fixation, and the last, in favor of open internal fixation.

PLASTER-OF-PARIS SPICA

The use of the plaster-of-Paris spica, the conservative method of treatment, was originally advocated by Whitman (66). In spite of active opposition, it has proved in some hands to be very efficient. This was demonstrated by Whitman in a report stating that in 441 cases of fracture of the neck of the femur in patients of various ages who were treated with the plaster spica, the mortality was less than 7 per cent and the union of the fractures varied from 53 to 90 per cent. Apfelbach and Aries (3), in using the walking plaster spica, report on 22 cases with no mortality and union in 77 per cent, with a hospitalization of only thirty days. Dickson (19) reports on 68 cases with a bony union in 70 per cent using the Whitman plaster spica. Cleveland and Bosworth (11) also have used the plaster-of-Paris spica cast and reported a union in 47.5 per cent of the patients surviving long enough to get a union. The immediate mortality in their series in which injury played an important part was approximately 14 per cent. They note a marked difference in the immediate mortality between ward and private patients. Of the ward patients 18 per cent died under treatment, while only 5.8 per cent of the private patients died. This difference in a large part is due to the nursing care, and stresses again the importance of constant care and observation required by patients enclosed in body casts. The author believes that the care of those imprisoned in plaster cannot be neglected if we hope to reduce the mortality with this conservative method. Kleinberg (34) reports 24 cases, 12 were true fractures of the neck of the femur and were treated with a body cast, which permitted the patient to be ambulatory. A solid bony union occurred in 22 of

the 24 cases reported. Langan (36) reports the use of the Jones splint in the treatment of the neck of the femur and pelvis, he secured good functional results in the majority of his cases. Mills (45) passes a Kirschner wire transversely through the upper part of the condyles of the affected femur and attaches a horseshoe so as to stretch the wire forcefully. He then extends, internally rotates, and abducts the fractured member, and applies a Whitman plaster cast down to the knee, incorporating the horseshoe in the plaster. This procedure permits early flexion of the knee and eliminates stiffness.

From the statistical records available it appears that the age of the patient influences the percentage of bony unions. This has been emphasized by Henderson (27, 28, 29) of the Mayo Clinic, who estimates the prospect of repair at 90 per cent in patients under sixty years, and at 65 per cent in those beyond that age. Yet Stern (60) in a group of 17 patients over seventy years of age reports union in 78 per cent. Cotton (14, 15) has amplified the manipulative reduction and immobilization in plaster by artificial impaction, but with this form of treatment the percentage of unions, taking all ages into consideration, does not show a relation between the age of the patient and the percentage of bony union.

Additional evidence is added to the failure of the plaster-of-Paris-spica treatment by one of the exponents of the closed method, Leadbetter (37), reports a series of 81 cases. Fifty-nine of these were followed up accurately. The ages of the patients ranged from forty to ninety-two years. The period of observation was from one to nine years. All of the patients were treated by closed reduction and skin-coaptation plaster fixation. Good union resulted in 71.18 per cent, good function but no bony union in 6.79 per cent, failure in 13.57 per cent, and death in 8.46 per cent. Thus 22.03 per cent of the cases resulted in failure. Leadbetter, in a recent article, states "It is not by one stereotype form of treatment that the problem of the fractured hip will be solved. Both plaster fixation and internal fixation should be taught. Open reduction is not necessary but in the final analysis it cannot be denied that *internal fixation is more adequate than plaster* and that early

depends on the degree of differentiation of the stem cell to which the neoplastic stimulus is applied. Moreover it is well recognized how the original teratomatous structure becomes masked by malignant proliferation and subsequent degenerative processes.

In my opinion it must be clearly emphasized that a testicular tumour should not be regarded as a true neoplasm until such time as unilateral malignant proliferation of one of its elements has declared itself a phenomenon which is more likely to affect the tissues of an embryoma than those of a normal organ.

The author also discusses the endocrine considerations of this tumor and he says there is strong *prima facie* evidence for the belief that the luteinizing gonadotropic hormone which occurs in the urine of pregnancy retained placenta, uterine chorio epithelioma and chorio epithelioma testis is in some way connected with the presence of chorionic tissue. The performance of quantitative tests for chorionic gonadotropic hormone would be valuable in the differential diagnosis of testicular new growths.

Gynecomastia should have little diagnostic significance as it appears in patients with testicular tumors which are not chorio-epitheliomatous. There should be a correlation of the amount of gonadotropic urinary hormone present and the histology of the growth so that valuable information as to the nature and source of the gonadotropic hormone may be obtained.

ALBERT MATHIEU M.D.

Giuliano A. Carcinoma in Ectopic Testes (Cáncer en testículo ectópico). *Boletín Soc. de Ciruj. de Buenos Aires* 1938 22 511.

Giuliano states that in 1919 Marotta published for the first time in South America the case of a seminoma which had developed in an ectopic testis. Since that time similar reports have been published in that country. From a statistical study it appears clearly that carcinoma of ectopic testes is less frequently encountered in Latin American countries than anywhere else although the figures given are not entirely reliable.

The author observed the case of a thirty-three year-old married man who at the age of eighteen had been operated upon for bilateral cryptorchidism. At the age of thirty this patient had suffered a severe injury of the left testis. When seen at the clinic he presented a bilateral cryptorchidism with the testes at the level of the external inguinal rings. For the past four months the left testicle had progressively enlarged in size and on examination the left inguinal region was found to be occupied by a tumor mass measuring 10 by 8 by 6 cm. The tumor was hard and fixed and presented a smooth surface. A ten-

tative diagnosis of carcinoma of the ectopic testicle was made.

Under spinal anesthesia the tumor mass was removed together with the regional lumbo-aortic lymph glands. Macroscopic examination of the specimen revealed the presence of a testicular tumor measuring about 9 by 7 cm. On sectioning the surface appeared grayish pink and of homogeneous structure. The normal structure of the testicle was completely obliterated and beyond recognition. The lumbo-aortic lymph glands were enlarged and markedly indurated. Microscopic examination confirmed the diagnosis of a seminoma of an ectopic testicle with metastases in the lumbo-aortic lymph glands.

Following the operation deep radium therapy was instituted and the patient made an uneventful recovery.

According to the author these tumors show a great tendency to form metastases not only involving the regional lymphatic chains but also extending into the supraclavicular, mediastinal and pulmonary regions.

In these cases Giuliano advises simple castration followed by deep radium therapy and he warns against radical interventions aiming at the removal of the deep intra-abdominal lymphatic chains. The dangers encountered in this connection include inadvertent injury to the inferior vena cava and the abdominal aorta. There is furthermore no special advantage in adopting radical procedures.

RICHARD E. SOMMA M.D.

MISCELLANEOUS

Duff J and Williams F W. Diabetes in Surgical Urology. *J. L. of* 1938 40 446.

As the result of a five year study of diabetic surgical cases the authors have concluded that the patient is a good surgical risk irrespective of the amount of sugar in the blood provided he is not dehydrated and that a minimum of sugar and no acetone are shown in the urine. The authors believe that dehydration and severe ketosis are the only contraindications to urgent surgery. The type of diabetes encountered in urological patients is usually mild and in the event of death it should not be of diabetic origin.

A complete description of pre-operative and post-operative management of the surgical diabetic patient is given. There is also a résumé of a five year compilation of data pertaining to patients whose cases were complicated by diabetes some of whom were operated upon and others who were not operated upon.

D. E. MURRAY M.D.

wire is driven in and the Smith-Petersen nail is guided over the wire and impacted into the neck. The wire is then withdrawn. Cases treated by this method have been satisfactory.

Grondahl (25) of Bergen, Norway, reports that after using Kirschner wires similar to those used by Dyas and Aries, he has entirely discontinued their use and has found the Smith-Petersen nails with the technique of Johansson far superior. This is also concurred in by Gilson and his associates (23). Luck (40) reports using a special device for obtaining the proper position of the Kirschner wire and modified Smith-Petersen nails. He reports good results. Cox (16) reports 18 cases satisfactorily treated with the Smith-Petersen nail with a hole in it. The youngest patient was fifty and the oldest eighty-four years.

Believing the Kirschner wire too small and flexible, and realizing the danger of its bending and curling on itself within the head, Campbell (9) used a larger wire with the modified Smith-Petersen nail. He reports the use of this method in 35 patients, 6 of whom died before end-results could be determined, none of these deaths was immediately postoperative. All of the patients under observation had an osseous union and, what is more, 17 of them have practically normal function in the hip and knee joints. It is Campbell's opinion that the presence of metal delays union, but the fixation attained apparently overcomes this objection and greatly enhances the normally delayed physiological process. Jackson (30) of Madison, Wisconsin, informed me that he is using a large pin guided by a protractor accompanied by the Smith-Petersen nail and is producing satisfactory results. Carrell (10) reports a simple method for the introduction of the Smith-Petersen nail with the use of a drill, however, he claims no originality for this method as it is similar to that of Wescott and others. The insertion of the drill determines the size of the Smith-Petersen nail, which is then threaded over the drill and driven in. Additional drill holes are made around the nail for circulatory channels. Following this procedure plaster leg supports are applied to both legs from the calves to and including the feet, cross bars maintain abduction. These splints are allowed to remain on four weeks. A brace is then worn for six months. The nail is later removed. No results are given. Carrell believes good function indicates a comfortable, easy gait, very little, if any, limp, 90 degrees or more of flexion, and fair abduction and rotation. Encouraged by the use of various forms of fixation Moore (46, 47, 48) devised the use of 3 nails. These nails are threaded and fitted with nuts at the distal third. They are

inserted by the closed method. Following this a piece of orthodontic stainless steel is wrapped from one pin to another and securely laces them together. The pins have been inserted with their points converging from an equilateral triangular base. This small wire positively prevents any or all of the pins from working out backward. The nuts prevent the pins from going forward and the nuts cannot work loose because of the wire wrapped behind them. In a recent article Moore reports on 24 cases, 1 with non-union and bony union in 96 per cent. This method has been adopted by Conwell and Sherrill (13), who report on 21 cases, the oldest patient was eighty-five and the youngest twenty-eight years. No deaths occurred and the average period of hospitalization was ten days. In this series there were 2 cases of non-union. It is the opinion of these authors that both of the patients in these cases commenced weight-bearing too early. However, in 1 case, there was a possibility that an interposition of the soft structures between the fragments was present. Conwell and Sherrill state further that no form of internal fixation should be considered a panacean treatment. Caldwell (8), realizing the advantages of Moore's method of treatment, employed this method in 44 cases, 29 of which were fractures of the neck. Twelve of the patients have died, but only 1 of the deaths was caused by infection. There was no attempt made to select the cases and many of them were obviously unsuitable for a spica or any form of traction because of feeble circulation, obesity, or incontinence. Caldwell believes that these fractures can be pinned and the period of survival is much more comfortable for the reason that the patients can be shifted in bed without the discomfort and agony which usually follows in those cases in which no fixation has been applied. A conclusion has not been offered by Caldwell, however, it is his opinion that by a judicious selection of the cases the mortality should be reduced and good end-results secured. Wescott (63, 64) employs the closed reduction as follows: the fracture is reduced and stereoscopic roentgenograms are taken, an incision from $2\frac{1}{2}$ to 3 in in length is made below the greater trochanter, and a small hole is bored into the bone with an osteotome to receive the blades of the nail. The length of the nail and the degree of angulation of the neck with the shaft are determined from the roentgenogram, then a bone protractor is set at a like angle and clamped. The nail is then driven in. This operation produces a minimum amount of shock, allows immediate active use of the joint, and prevents the usual complications expected from a prolonged period of

mobilization of the individual is most important in preventing chronic disability in the aged. Plaster fixation cannot be expected to yield good results consistently and logically in more than 65 to 75% of the cases.

CLOSED INTERNAL FIXATION

At the present the general trend seems to be toward internal fixation with the closed treatment. A special impetus has been given to this method by the advent of good effective lateral x-ray views of the hip joint. It is my opinion that this form of treatment, namely, internal fixation, would not be as popular as it is had lateral views of the neck of the femur been available in the plaster spica cases (lateral views are now obtainable). The low percentage of unions was probably due to the failure of adequate reductions. Cotton (14, 15) believed that proper reduction or over reduction, accurate approximation of the surfaces, followed by fixation with metal screws or pins to prevent rotation with the least possible destruction of the bone of the neck, seem to have gained favor. For many years he had been an advocate of impaction and immobilization in plaster. Recently he stated it is fair to say that blind nailing in one form or another has come to stay.

Internal Fixation with Screws. Brewster and Martin (6) report 53 cases treated by means of 2 screws with union in 89.68 per cent and failure in 11.32 per cent. There was no immediate postoperative mortality attributed to the operative procedure. The screws used had a wide thread rather than a machine thread as it was believed that a better purchase on the spongy bone could be obtained. Goeckeler (24) reports the use of 2 screws for the reduction of the fracture by the Whitman-Leadbetter method. No final report is made. Lipmann (39) has developed a new device similar to a cork screw for securing and maintaining fractures of the femoral neck. Complete report as to the end results is deferred until additional conclusive data have accumulated. However, thus far the device gives indication of fulfilling its purpose.

Internal Fixation with Wire. Gaenslen (2) reported 10 cases with encouraging results treated by means of a Kirschner wire in a subcutaneous spike fixation of the neck of the femur. Dyas and Aries (20) also used wires similar to Gaenslen. Telson and Ransohoff (61) report on 16 cases treated by axial fixation with steel wires in which there were 11 bony unions and 7 failures, either delayed union or death. Rowlette and others (52) in their cases of fractured neck of the femur were

not satisfied with plaster of Paris or a non-traction and being impressed by the reports of Knowles and Gaenslen because of the simplicity and cheapness of the subcutaneous pinning, decided to adopt their methods. However, Knowles' method was modified to the extent that the strainless steel pins were threaded so that they could be screwed into the bone. End results are reported in 29 cases: 6 patients died, 4 had non-union and 13 had a good firm bony union. In 3 the end results were not determined. Therefore 43 per cent of the first 29 cases have had what appears to be a firm bony union.

Internal Fixation with Wire Flanges Pin and Nails. Great credit should be given to Smith-Petersen as he has revised the use of metal in the neck of the femur, and it is my opinion that the present trend of internal fixation is a direct result of his efforts.

Many surgeons realized the possibilities of the use of the Kirschner wire for maintaining accurate reduction after manipulation but were afraid that the wires either were not strong enough or would migrate into the pelvis and therefore they were in search of a more adequate form of fixation. Accordingly they adopted the use of the Smith-Petersen nail modified by Johansson (31, 32) whose procedure is as follows: The Kirschner wire is drilled into position after reduction of the fragments and the Smith-Petersen nail is threaded over this wire and driven in through the trochanter neck and into the head of the femur, the fragments being thus secured in anatomical position and impacted or better approximated in accurate position. Johansson reports 125 personal cases with bone healing in 100. Burman (7) has adopted the Johansson method and reports good results. Ferciot (21) in using the Kirschner wire and the Smith-Petersen nail believes that this procedure causes very little shock to the patient and can be carried out under local anesthesia also that it reduces hospitalization and permits early mobilization and that union occurs in from 75 to 90 per cent of the cases so treated. Bailey (4) reports a method for the accurate introduction of the Smith-Petersen nail over a Kirschner wire based on two anatomical facts: (1) the anterior surface of the neck of the femur is a comparatively flat plane extending on to the anterior surface of the shaft immediately below the greater trochanter; (2) a line through the center of the neck passes $\frac{1}{2}$ inch behind this plane and emerges from the outer surface of the femur $\frac{1}{5}$ inch below the lower border of the greater trochanter under cover of the origin of the vastus externus muscle. With the use of an introducer the Kirschner

It is Magnuson's (42) opinion that if there is considerable obliquity of the fracture line, visual reduction is preferable with fixation applied while the fracture is in view. The line and plane of the fracture and the amount of displacement immediately after the injury are factors to be considered in the prognosis and the treatment. Magnuson reports good results following the use of his modified Brackett operation in fresh cases. Cubbins, Callahan, and Scuderi (17) have developed a new incision for the exposure of the neck of the femur and employ the Scuderi-Callahan 2-flange nail and director. The stimulus for this work was the poor results obtained by the closed method. It is our opinion that interposition of soft tissue, failure of accurate reduction and approximation, and lack of firm immobilization were the pitfalls of the closed method. We have operated on 105 cases with firm bony union in 90 per cent and 1 death. In an article Dickson (19) states that he has used the Smith-Petersen nail in 9 cases and secured a bony union in 7 or 77 per cent. Death occurred in 2 or 22 per cent. He emphasizes the difference between open and closed fixation by revealing that the abduction method produced a bony union in from 53.8 to 70 per cent of the cases and a mortality of from 13 to 25 per cent, while the end-results of the open reduction varied from Albee's union in 97.4 per cent to Smith-Petersen's union in 83.8 per cent, with a mortality of 10 per cent. These figures would indicate that the open method gives decidedly better results and a lower mortality. Cubbins, Callahan, and Scuderi's results confirm Dickson's conclusions.

Non-union of old fractures

Albee's (1) observation of 412 non-unions over a period of twenty-five years has shown that there was almost a complete absence of blood supply to the capital fragment in these cases, and it is his opinion that the blood vessels are either torn at the original injury or occluded later. With Wolcott's permission, Albee states, "that anatomically there are meager or no blood-vessels in the ligamentum teres in 15% of cases, and inasmuch as his findings in non-unions showed no blood-supply from this source in close to 100%, it is apparent that the trauma resulted in its destruction in the remaining 85%." However Kruecher and Chandler's (35) opinion differs regarding the blood supply in the ligamentum teres. It is based on a study of the ligaments removed from 60 adult cadavers, the average age of the patients being forty-eight years at the time of death. Histological preparations were made near the junction of the ligament with the femoral head. These authors stated that *all ligaments* contained ves-

sels, but there was considerable variation in the number of vessels found. Simpson and Henderson (57) reported a new method with a lagscrew fixation in ununited fractures of the neck of the femur. This method was developed because in some instances the metal flange nail became loose. Three cases were reported with good results.

Henderson (27, 28, 29) also reports that of 632 patients who came to the Mayo Clinic because of fractures of the hip there were 410 with old ununited fractures. The latter were dismissed without treatment because fibrous union was giving sufficient support, or because senility, cardiovascular disease, nephritis, diabetes, or other conditions rendered surgical intervention too hazardous. In 222 cases of either fresh or old fractures of the neck of the femur treatment was advised. Of these 97 were ununited fractures of the neck of the femur. Of this group 59 were operated upon and an autogenous bone graft was inserted. Henderson prefers the Kirschner wire as a guide for its insertion. Bony union was reported in 70 per cent of these cases. A beef-bone peg or screw was used in 10 cases and successful results obtained in about 50 per cent. Whitman reconstruction was resorted to in 23 cases and was the operation of choice for skeletal support. The Brackett operation was used in 5 cases and the results were so satisfactory that it is Henderson's opinion that it should be employed more often.

Colonna (12) reports 15 cases of old ununited fractures of the neck of the femur treated with his own method of reconstruction, very briefly the essential features are

- 1 Sectioning close to their insertions all of the muscles attached to the region of the greater trochanter, preserving a thin layer of fibro-muscular tissue over the upper end of the bone

- 2 The removal of the loose head.

- 3 The placing of the upper extremity of the femur deeply and firmly within the acetabulum and transplanting of the gluteus medius and the gluteus minimus group of muscles downward on the shaft of the femur as far as they will reach, securely fastening them to the underlying bone.

Thirteen of these patients are still living, and with the exception of 1 in whom operation was a failure and 1 who died, all present excellent hips. Macey (41) concurs with Colonna in his reconstruction operation.

As a substitute for the more extensive surgical procedures the Schanz osteotomy (53, 54, 55) is becoming popular, the mechanics of which are as follows: "Through the angulation of the neck, the fracture site is placed below the head and the body weight no longer pushes the head downward

fixation and recumbency. Wescott reports on 33 cases. There were 3 cases of non union following the operation. 2 of them due to lack of co-operation. Three deaths occurred but it is Wescott's belief that they could not directly nor indirectly be attributed to the operation. A complete list of the end results is not published.

Thornton (62) of Atlanta, Georgia, reported at the Congress of the American College of Surgeons in October 1937 that he used the Smith Petersen nail immediately after the fractures occurred and secured excellent results. Bozsán (5) of New York suggests drilling of the greater trochanter and of the neck and head of the femur ten days after the fracture followed by immobilization in a Whitman plaster cast and reports excellent results. Anderson (2) new method which as yet has not been published was demonstrated at the American College of Surgeons Meeting in Chicago 1937. He advocates the use of the pin in the condyles of the affected femur instead of in the tibia. He believes firmer fixation and immobilization can be obtained by this method. Plummer (51) states that he is not satisfied with wires as they are inadequate mechanically and are dangerously prone to wander into the pelvis. He also used Moore pins but they failed to satisfy completely the mechanical requirements and at the present time he has been receiving excellent results from the Smith Petersen nail. He reports 37 cases with 9 deaths. O'Meara (49) reports on his use of the Smith Petersen nail with the closed method in 14 cases, the average age of the patients being sixty-eight years. He had 1 failure. White (65) has devised an instrument facilitating the use of the flanged nail in the treatment of fractures of the hip. The nail is very similar to the Smith Petersen. The advantage is that a combined impactor and extractor may be screwed into the distal end of the nail.

Smith Petersen (58) who is responsible for the present impetus of internal fixation in the neck of the femur has now forsaken his first love and been converted to the closed reduction. Smith Petersen states: Five years have elapsed since the first report on internal fixation of fractures of the neck of the femur by means of the flanged nail was published. The principle of the nail has been widely accepted, not so the open reduction. In view of the good results reported from the use of the closed reduction followed by nailing through a small incision we have come to the conclusion that the open reduction is unnecessary in fresh fractures in old ununited fractures open reduction is indicated and good results are obtained in selected cases.

OPEN INTERNAL FIXATION

Having covered the opinions of various men advocating conservatism and using the plaster of Paris spica and who prefer the closed reduction with internal fixation we now come to the opinions of those who prefer the open reduction.

Harris (26) of Toronto, Ontario, reports on 50 cases treated by the open method with the Smith Petersen nail. Firm bony union resulted in 72 per cent, imperfect union in 4 per cent, and failure and death in 24 per cent. Jones (33) of Liverpool, England, reports using the Smith Petersen method from 1930 to 1933. He had a total of 59 cases. The average age of his patients was fifty-seven years. Twenty-nine or 49 per cent of his patients were operated upon. Failure occurred in 4 and 2 patients died. Bony union occurred in 73 or 79 per cent. Jones also used a lateral approach with exposure of the fracture which was followed by nailing. Forty-one patients were treated in this manner; their average age was sixty years. Thirty-five or 85 per cent were operated upon with 1 failure from sepsis. Two died. Bony union occurred in 29 or 91 per cent. Albee (1) also used the open operation employing an autogenous bone graft peg of a large size which in his opinion furnishes immobilization and active osteogenetic bone cells to the fractured junction.

McMurray (43) of Liverpool, England, advocates the use of the oblique osteotomy in fresh cases having been encouraged by its use in old cases. He reports on 4 cases of transverse fracture treated by this method and anticipates good results. His choice of this method is based on the following facts given by him: Drawbacks of the Whitman and Smith Petersen Methods. The advantages of these two methods are evident. By their use the end results of treatment of this type of fracture have been greatly improved but neither method is without risk and their true value can only be appreciated by realizing their disadvantages which in Whitman's method are: (1) the frequency with which non union follows on even the most careful treatment; (2) the risks to these elderly patients which follow on prolonged fixation in the very uncomfortable position of abduction and hyperextension; (3) the rigidity of the joints which is caused by the fixation and twisting of the limb over a long period. The disadvantages of the insertion of a metal pin are: (1) the risks of failure to insert the pin in the ideal position and the very definite risk of non union; (2) the occurrence of fragmentation in the head of the femur following an apparently successful operation; (3) the very definite risk of infection in the hands of non experts in the method.

| Author | Type of treatment | No. of cases | Mortality | End results |
|-------------------------------|---------------------------------|--------------|---------------------|----------------------------|
| OPEN INTERNAL FIXATION | | | | |
| Harris | Smith-Petersen nail | 50 | 24%—death & failure | 72% bony union |
| Jones | Smith Petersen method | 59 | 2 deaths | 79% bony union, 4 failures |
| Jones | Watson-Jones method | 41 | 2 deaths | 91% bony union 1 failure |
| Albee | Autogenous bone peg | | | Good |
| McMurray | Oblique osteotomy (fresh cases) | 4 | | Expect good results |
| Magnuson | Brackett (fresh cases) | | | Good |
| Cubbins, Callahan, and Scuden | Scuden Callahan flange | 105 | 1 death | 90% bony union |
| Dickson | Smith-Petersen | 9 | 22% | 77% bony union |

NON-UNIONS OR OLD FRACTURES

| | | | | |
|-----------------------|---------------------------|----|---------|--------------------|
| Simpson and Henderson | Lagscrew | 3 | | Good |
| Henderson | Fibula and Kirschner wire | 50 | | 70% bony union |
| Henderson | Beef bone peg or screw | 10 | | 50% bony union |
| Henderson | Whitman reconstruction | 23 | | Good |
| Henderson | Brackett | 5 | | Very satisfactory |
| Colonna | Colonna reconstruction | 15 | 1 death | 13 good, 1 failure |
| Macey | Colonna reconstruction | | | Satisfactory |
| Schumm | Schanz osteotomy | 13 | | Satisfactory |
| McMurray | Lorenz bifurcation | 27 | | Very satisfactory |

past the fracture surface but directly against it. This provides more favorable weight bearing relations and may even lead to late bony union." Schumm (56) reports 13 cases of non-union of the neck of the femur in which the Schanz osteotomy was performed with a minimum amount of shock and satisfactory results. McMurray (43) of Liverpool, England, stated in 1936 that he preferred the Lorenz bifurcation in ununited fractures of the femur and reported 27 cases resulting in very satisfactory end-results. In a subsequent report in 1938 he gives a detailed account of the treatment of fractured neck of the femur by oblique osteotomy, which he believes is very efficient in the treatment in fresh cases or cases of non-union.

The two methods that are used to obtain bony union in ununited fractures of the femur are (1) bone grafting, with autogenous and heterogenous grafts which are fastened with pins, screws, and flanges, and (2) reconstruction (Whitman, Colonna, Brackett, Lorenz bifurcation, and Schanz osteotomy). Regardless of how well many of the above operations are performed we are reminded by Henderson that, "Even if the mechanical requirements of reduction and fixation are fully complied with there is still a nigger in the wood

pile, that is, the blood supply of the head of the femur." Wolcott's studies (67) on the blood supply of the neck of the femur in relationship to non-unions is substantiated by many surgeons. One cannot help but note some observations made by Phemister (50), "that intracapsular fracture of the neck of the femur may, by injury of blood supply, result in aseptic necrosis of a part or all of the head of the femur. This occurrence greatly increases the likelihood of non-union of the fracture. In case of non-union, atrophy of disuse of the living bone develops during the period of immobilization while the dead bone of the head does not atrophy. Connective tissue and blood vessels slowly invade the dead bone which in turn is absorbed and replaced by new bone by the process of creeping substitution."

An interesting observation has been noted by Dalby and his associates (18) regarding the occurrence of fractures of the neck of the femur following irradiation for pelvic malignancy. He reports 14 cases of spontaneous fracture of the neck of the femur following irradiation. The average age of the patients was fifty-seven years and in each case pain antedated the diagnosis of fracture by months. Roentgenograms of the femur were

| A b r | Type of treatment | N. of cases | Mortality | End result |
|---------------------------------|--------------------------------|-------------|-----------|----------------|
| W. H. C. S. | C. S. | 441 | 3% | 51% bony union |
| Apf. Iba. b. and. In. | Walk. open. t. | 22 | | 75% bony union |
| Dickson | C. t. | 62 | | 75% bony union |
| Cleveland. d. a. d. B. w. n. b. | L. t. | | 6% | |
| K. e. n. b. e. r. g. | Ambulatory cast | 4 | | 60% bony union |
| Lang | Exsplant. | | | Good |
| M. d. | Kirschner wire n. c. dyle-cast | | | |
| C. r. n. | Cast | 17 | | 75% bony union |
| C. t. | C. t. | | | Good |
| Le. d. o. e. t. t. e. | C. t. | 8 | 8.46% | 75% bony union |

CLOSED INTERNAL FIXATION

| | | | | |
|----------------------------------|--|----|--------|------------------|
| B. w. s. t. and. M. t. | C. r. n. | 53 | | 80.6% bony union |
| C. u. c. k. l. e. | crews | | | |
| Lipman | C. r. n. | | | |
| Ge. d. | W. es. | | | Encouraging |
| D. y. and. A. n. e. | W. | | | Good |
| T. e. l. and. R. n. o. b. l. f. | W. es. | 6 | | 75% union |
| Rowlette. and. O. t. h. | W. r. n. | 9 | 6.6% | 50% bony union |
| J. h. n. s. | W. r. n. d. S. m. t. h. P. t. r. n. d. | 5 | deaths | 100% bony union |
| Burman | W. r. n. d. S. m. t. h. P. t. r. n. d. | | | Good |
| F. r. e. t. | W. r. n. d. S. m. t. h. P. t. r. n. d. | | | 75% bony union |
| Hailey | W. r. n. d. S. m. t. h. P. t. r. n. d. | | | 50% union |
| Gr. n. d. a. t. | W. r. n. d. S. m. t. h. P. t. r. n. d. | | | 50% union |
| G. o. o. | W. r. n. d. S. m. t. h. P. t. r. n. d. | | | factious |
| L. u. k. | W. r. n. d. S. m. t. h. P. t. r. n. d. | | | union |
| C. o. | W. r. n. d. S. m. t. h. P. t. r. n. d. | 8 | | 50% union |
| C. m. p. b. e. l. l. | W. r. n. d. S. m. t. h. P. t. r. n. d. | 35 | deaths | 90% bony union |
| J. a. k. s. o. | F. i. n. g. e. r. S. m. t. h. P. t. r. n. d. | | | union |
| C. r. e. l. l. | D. n. l. and. S. m. t. h. P. t. r. n. d. | | | |
| Moore | S. | 4 | | 60% bony union |
| C. w. e. l. l. d. S. n. r. n. d. | S. n. a. l. e. | | | Good |
| C. a. l. d. e. n. | S. n. a. l. e. | 4 | deaths | |
| W. e. s. c. o. t. t. | S. m. t. h. P. t. r. n. d. | 3 | 50% | |
| T. h. r. i. n. | S. m. t. h. P. t. r. n. d. | | | Encouraging |
| B. n. s. | D. n. l. and. S. m. t. h. P. t. r. n. d. | | | Encouraging |
| A. d. r. o. o. n. | P. c. o. n. d. y. l. f. l. e. m. | | | |
| Flann | W. r. n. d. S. m. t. h. P. t. r. n. d. | 37 | deaths | |
| Q. M. | S. m. t. h. P. t. r. n. d. | 14 | | factious |
| Smith. P. t. r. n. d. | S. m. t. h. P. t. r. n. d. | | | Good |

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Haggart, G. E. Sciatic Pain of Unknown Origin
An Effective Method of Treatment *J Bone & Joint Surg*, 1938, 20 851

The author presents an effective method of treatment for the relief of sciatic pain, especially applicable in those cases in which the etiology is unknown and in which immediate relief is desirable while attempts are being made to determine the cause. He believes, as does Badgley and Steindler, that sciatic pain is referred from pathological changes in or about the intervertebral foramina, arising from a primary lesion located in the lumbar, lumbosacral, or sacroiliac regions.

Contrary to the treatment of most orthopedic surgeons, Haggart attempts to mobilize his patients as quickly as possible. In the group of 75 cases upon which he reports, he used a combination of the following procedures: (1) perineural injection of the sciatic nerve with novocaine, (2) traction to the affected extremity, and (3) careful manipulation of the low back under pentothal anesthesia.

His objective in the injection procedure is the perineural area of the sciatic nerve as it emerges from the pelvis through the greater sciatic foramen, plus injection of the adjacent fascia and the substance of the piriformis muscle.

The author determines the point of insertion of the needle by the intersection of a line projected directly lateral from the apex of the intergluteal fold with an imaginary line drawn perpendicularly from the ischial tuberosity. This point is checked further by an imaginary line drawn from the midlateral aspect of the greater trochanter to the spinous process of the fifth lumbar vertebra. This line indicates the extreme lateral boundary of the injection field and usually intersects the other lines at the same point.

A 6-in., 20 gauge needle is then passed medially at an angle of 45 degrees with the skin surface. When the needle strikes the sciatic nerve, which can be identified by the immediate reaction of the patient, it is withdrawn about 5 of a centimeter. Two more needles are inserted, one on each side of the first, into the substance of the piriformis muscle and the surrounding fascia. Into each needle approximately 50 c cm. of 1 per cent novocaine mixed with a small amount of adrenalin are injected.

The results were best when the injection was combined with manipulation of the low back under general anesthesia.

DANIEL H. LEVINTHAL, M.D.

Geschickter, C. F., and Maseritz, I. H. Primary Hemangioma Involving Bones of the Extremities. *J Bone & Joint Surg*, 1938, 20 888

Primary hemangioma of bone is a relatively uncommon lesion. There are 11 reported cases of symp-



Fig 1 Hemangioma of the humerus

tomatic primary hemangioma involving bones of the extremities. Four additional cases are presented. One of these, an angioblastoma in bone tissue, is the first case of its kind to be reported.

The youngest patient was eight years of age, the oldest twenty. Three of the 4 patients gave a history of trauma, 2 had had pathological fractures, and a third had received a crushing injury.

The roentgenographic changes of primary hemangioma of bones in the extremities are similar to those of benign giant-cell tumor or osteitis fibrosa cystica. The differential features are that the lesion of primary hemangioma of bone tends to progress and may be more extensive, the locules, when present, are smaller than the lobules of the benign giant-cell tumor or the benign bone cyst. The walls of the locules in a primary hemangioma of bone possess a heavier framework.

Primary hemangioma of bone gives rise to cystic cavities which contain no capsular lining. Like bone cysts, they may contain fluid or tumor tissue.

taken months and even years before the fracture occurred and in no instance was neoplastic growth positively demonstrated roentgenographically at the fracture site. Six patients had no evidence of metastasis at the time of fracture. All patients were re-examined following the fracture and did not show metastasis. Nine of the patients with fractures developed non union and none of the patients showed any callous formation when observed after ten months or later. Dalby's reasons for these phenomena are highly speculative. Present day roentgen treatment of pelvic malignancy employ a higher voltage than formerly, likewise the amount intensity and duration of treatment have increased so that irradiation may be an important factor in the production of this complication.

CONCLUSION

The conscientious work of these men and their frankness in admitting failure as well as success will lead us to a better understanding of this all important fracture which in the past has been as Speed (59) states "The Unsolved Fracture".

As most of the fractures of the neck of the femur occur in the aged and none of the authors claim power of rejuvenation in their methods, and as few if any other bones result in 90 per cent union after fracture I believe that the Answer is not too far distant.

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SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

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DANIEL H. LEVINTHAL, M.D.

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tomatic primary hemangioma involving bones of the extremities. Four additional cases are presented. One of these, an angioblastoma in bone tissue, is the first case of its kind to be reported.

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within the wall. The tumor material filling these cavities is apparently similar to the tissue of angiomatous tumors elsewhere.

The microscopic findings in hemangioma of bone presents various features for classification. The 4 new cases presented are classified as capillary hemangioma, cavernous hemangioma, angioblastoma and angiosarcoma.

The sections of the capillary hemangioma showed areas of hemorrhage between which were capillaries with their single layers of endothelium and hyaline contents. There were large cystic cavernous spaces filled with red blood cells, occasional lymphocytes and polymorphonuclear leucocytes. The irregularly shaped sinuses in the cavernous hemangioma contained coagulated material and were lined with endothelium. Definitely formed capillaries and stroma containing young fibroblasts were interspersed between the many channels. The angioblastoma had tortuous tubules which lay in a fibrous stroma. These tubules usually contained a colloid like material. There was an occasional small capillary. The tissue of the angiosarcoma consisted of many cavernous spaces lined by single rows of endothelial cells and contained deeply staining material. Between these spaces were many small tightly packed endothelial cells which frequently contained a small centrally placed nucleus. These cells were uniform in size and were found to be stained deeply.

Irradiation is the most valuable method of treatment for primary hemangioma of bone. Complete cures have been reported in a number of cases. The value of curettage is questionable. Adequate resection of bone has produced cures.

ROBERT L. MONTGOMERY, M.D.

Moulouquet P. and Pollosson E. Sarcoma of the Muscles and the Surrounding Connective Tissue of the Extremities (*Sarcomes des muscles et des coul es conj nctives des membres*). *J. de chir.* 1938, 52, 501.

Moulouquet and Pollosson distinguish the sarcomas of the connective tissue separating the muscles and surrounding the blood vessels and nerves from those of the muscular tissue. In a series of 110 cases they found 37 cases of sarcoma of the muscles, 43 cases of sarcoma of the connective tissue and 30 cases in which the record did not indicate clearly the tissue involved. They note that the tumors involving the connective tissues are small and are rarely noticed in their earliest stage when they become larger they are rounded in shape and well encapsulated but the capsule does not prevent the invasion of the surrounding tissue by the malignant cell. The skin covering the tumor is usually normal. In sarcoma of the muscular tissue the tumor may be encapsulated but it is more apt to be infiltrating. Such tumors become noticeable at an earlier stage than those of the connective tissue when the muscle is relaxed such a tumor is movable but when the muscle is contracted it becomes immovable. The

skin above the tumor is usually uneven and discolored—of a violet color. In cases that are operated upon recurrence usually takes place in or near the scar of the operative wound.

Sarcomas of the muscles and related connective tissues of the extremities may be of various histological types. In their series the authors found fibrosarcoma to be the most frequent type it occurred in 38 cases. Liposarcoma was next in frequency (33 cases). angiosarcoma occurred in 16 cases and rhabdomyosarcoma in 13 cases. Other types were less frequent in 8 cases the sarcoma was made up of embryonic mesenchyme cell in 6 cases of giant cell and in 5 cases of osteoblasts. In the last group the roentgenograms showed areas of calcification clearly separated from the bone. In 2 additional cases operated upon as sarcoma the histological examination and clinical course showed the tumor to be benign. Histologically these tumors closely resembled myeloplaxoma of bone they were classified as xanthogranuloma.

Seventy seven of the 110 patients in the authors series have died, 11 are living but show a recurrence, 16 have recently been operated upon and 15 are cured. Four patients were children of the age 2 died and 2 are living and well seven and nine years respectively after the operation.

In the treatment of such cases a simple excision of the tumor is definitely contraindicated on account of its definite malignancy. A sufficiently extensive resection with removal of the surrounding tissue is usually impossible. In tumors involving the muscle tissue only a myectomy may be done and this may represent a sufficiently extensive resection. Amputation may be done in some cases but in most instances amputation done too close to the tumor and there is a recurrence in the amputation stump. In the authors series amputation was done in 34 cases but in most of the cases it was done too late after repeated attempts at local excision. Disarticulation of the affected limb gave better results the authors series included 4 disarticulations at the hip and 2 at the shoulder. In the cases in which radiotherapy was employed the tumor was found to be radiosensitive showing a marked diminution in size and sometimes disappearing entirely (19 cases) but the tumor proved to be radio resistant in 6 of the cases.

In considering the treatment employed in the 15 cured cases the authors note the following in 5 cases cure followed local operation in the cases it is evident that the tumor was of low malignancy. One cure was obtained by treatment with diathermy coagulation with the high frequency current. In 2 cases cure followed amputation after unsuccessful local operation and in a primary amputation a third case may be included in the latter group as the patient died thirteen years after operation from pneumonia and death was apparently not due to the advance of the sarcoma. No case of cure can be attributed to radiation alone but in 10 cases radiotherapy was used as an adjunct to operation in 2

of these cases the limb was sacrificed (amputation and disarticulation)

In the presence of a small or moderately large tumor of the muscle or connective tissue of an extremity, the authors advise that it should be excised as a form of biopsy, and immediate histological examination made, in large tumors a biopsy specimen should be obtained. Radiotherapy may be tried if the tumor is of a radiosensitive type. The authors have found certain types of angiosarcoma and liposarcoma to be most radiosensitive, but they consider further study of the relation of histological type to radiosensitivity to be most important. However, in many cases sacrifice of the limb, either by high amputation or disarticulation, is definitely indicated. In some cases the most radical operation—interscapulothoracic disarticulation of the shoulder or interilio-abdominal disarticulation of the hip is necessary.

ALICE M. MEYERS

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Mondolfo, S. Resection or Arthrodesis in Tuberculosis of the Knee? (*Resezioni ed artrodesi nella tubercolosi del ginocchio?*) *Arch. ital. di chir.*, 1938, 49, 241

The author operated on 65 cases of tuberculosis of the knee performing a resection in 37 and an arthrodesis in 28. In the group treated by resection 51.4 per cent of the cases were operated upon during the period of evolution of the tuberculosis and 48.6 per cent during the regressive period. Good clinical results were obtained in 86.5 per cent and poor results in 13.5 per cent. Of the 28 cases in which arthrodesis was performed 10.71 per cent were operated upon during the period of evolution and 89.19 per cent during the regressive period, with good results in 81.48 per cent and failure in 18.52 per cent.

The author draws the following conclusions:

1. In gonitis with a moderate or slight destruction of the osseous portions, a resection during the reparation period is indicated, after the inflammation has decreased.

2. Resection should be performed also, if possible, during the period of reparation, if the gonitis is responsible for a grave destruction of the osseous portions with formation of sequestra and there is a tendency toward pseudarthrosis.

3. In specific synovitis arthrodesis is indicated during the reparation period. If possible, the intra-articular type of operation is the one that should be selected.

4. In deforming arthrosis resulting from a progressive gonitis arthrodesis is suggested and, whenever possible, the method of Ianas and Mezzari should be chosen on account of its great simplicity.

5. If contraindications to resection exist, the intra-articular method of arthrodesis is preferable to the extra-articular method.

JOSEPH K. NARAT, M.D.

Smith, A. DeF., Butte, F. L., and Ferguson, A. B. The Treatment of Scoliosis by the Wedging Jacket and Spine Fusion. A Review of 265 Cases. *J. Bone & Joint Surg.*, 1938, 20, 825

The authors performed fusion in 287 of 1,498 patients with scoliosis which came under their care. The indications for fusion in their clinic were as follows:

1. A curve which is progressing in the growing child.

2. A severe curve with imbalance of the trunk, whether or not the patient is beyond the period of growth.

3. A deformity which is causing pain or fatigue. In some of these cases an operation could be performed without previous correction. The patient was sent first to a special scoliosis clinic where a complete routine history was taken and physical examinations were done, including measurement of the total height, sitting height, and length of the lower extremities. In some cases a study of the vital capacity was made. Roentgenograms were taken in the standing and lying positions.

In those requiring fusion a jacket was applied which was essentially the same as that described by Risser in 1931 with several modifications, namely, that only enough traction was applied to the head to hold it in position and the cast was applied with the head tilted toward the side of the concavity of the curve. The authors point out that the wedging procedure not only corrects the primary curve but also increases the compensatory curve. After the jacket has been removed the compensatory curve straightens in proportion to the degree that the primary curve has been corrected and the body balance is re-established in those cases in which the primary curve is only partially corrected.

The following rules were used to identify the primary curve:

1. When 3 curves are present, the middle one is usually the primary curve.

2. When in the sitting position the pelvis is elevated on the side of the convexity of the lumbar curve, this curve will tend to straighten if it is compensatory.

3. If the curve just described is primary, it remains.

The Hibbs method of fusion was used in all cases and only 5 vertebrae were fused at one time, in this way shock was minimized and the mortality was reduced from 19 to 0.66 per cent. Glucose was given intravenously during the operation, and frequently blood transfusion followed the injection.

The patients were kept in bed in the original cast for three months. A second cast was then applied in the position assumed naturally by the patient. A strap of plaster was included over the shoulder opposite the curve in order to hold the neck and head over. After a lapse of three or more months a cast without shoulder straps was applied, with the patient almost completely straight. This was removed after three months, and if the roentgenograms

revealed a solid fusion no more casts were applied. A loss of 10 per cent of correction occurred in the average case. Greater loss indicated incomplete fusion.

Pseudarthrosis occurred in 61 cases 47 of which were reoperated upon and the defect was repaired. In some of the later cases the authors supplemented the mass of chips from the lamina with multiple tibial chips.

The results of this treatment were excellent in 79, per cent fair in 15.6 and poor in 4.7.

The authors concluded from their work that the combination of the wedging jacket and fusion is the most effective method yet devised for the correction and maintenance of the correction of lateral curvature of the spine. DANIEL H. LEVINTHAL, M.D.

L. Escapote, J. B. Bone Block for Painful Hips *J. Bone & Joint Surg.* 1938 20 901

A new operative procedure for the treatment of painful hips is presented. The idea was conceived in 1927 when the graft in an extra articular arthrodesis failed to unite to the trochanter but firmly attached itself to the ilium. The patient who had had a painful hip from tuberculosis was allowed to walk and was found to be free from pain. In 1932 the bone block was intentionally done in a young adult with a painful hip resulting from changes believed to be subsequent to an untreated slipped epiphysis and this was followed by relief from the symptoms. Since that time 15 patients have been operated upon by the following technique.

The hip area and the side of the ilium are exposed by a modified Smith-Petersen incision the upper arm of the incision being brought well back along the crest of the ilium to expose the crest and the upper portion of the side of the ilium and permit the removal of a good sized graft. Either a straight or curved graft is removed from the ilium. If there is no protrusion at the outer junction of the head and the acetabulum a straight graft is stretched across the joint between the ilium and the trochanteric

fossa or the greater trochanter. In some cases there is a mass of bone at the acetabulofemoral junction so that a straight graft does not work satisfactorily. In that case a curved graft is necessary. The graft should be about 1 1/2 in. wide and sufficiently long to reach between the points of contact which have been previously determined. When measuring for the length of the graft the surgeon should adduct the thigh so that after the upper end of the graft is placed in a slot on the side of the ilium the lower end is jammed tightly against the trochanteric fossa as the thigh is adducted to the straight or neutral position. Care must be exercised to prevent the slightest abduction. In that the graft is firmly pushed into the ilium as the thigh is brought from the adducted to the neutral position no sutures are necessary to hold it in place. The wound is closed as any similar incision. A hip spica bandage is applied from the nipple line to the ankle. This is changed to a short spica bandage after from six to eight weeks and the patient is allowed to walk with crutches. Complete weight bearing is permitted as soon as roentgenographic examination shows union of the graft to the ilium which is usually after from ten to twelve weeks.

The author has performed this operation in 17 cases: 4 of slipped epiphysis, 3 of congenital dislocation of the hip in which it was done instead of a shelf operation, 4 cases of tuberculosis and 6 cases of hypertrophic arthritis. Brief case histories of 13 patients who had been followed up for two or more years since the operation are reported. Of these patients 8 have been relieved of pain, 3 have benefited and 1 has not been benefited. In 1 case the final result is unknown.

It is difficult to explain the rationale. It is the author's opinion that the pain is relieved because the graft takes on some of the weight in walking and thus relieves the weight bearing joint surface. This theory is supported by the fact that the graft is essentially parallel with the neck of the femur and it

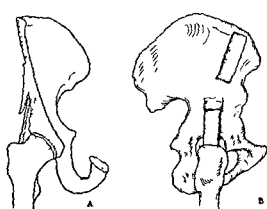


Fig. 1 Diagrammatic drawing showing the technique of the operation when a straight graft is used.

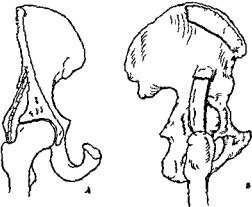


Fig. 2 Diagrammatic drawing showing the technique of the operation when a curved graft is used.

takes up the stress and strain of the neck, as evidenced by the growth of the transplant as time goes on. All of these patients developed an adduction and flexion deformity. He took this as an indication that abduction produces pain and that this development is a protective mechanism, and believes that the operation merely helps nature in this way. He emphasizes that the graft has to be long enough to prevent abduction beyond the neutral position or the operation will be a failure.

PAUL C. COLONNA, M.D.

Haas, S. L. The Correction of Extreme Flexion Contracture of the Knee Joint. *J. Bone & Joint Surg.*, 1938, 20: 839

Haas states that the method of correction of extreme flexion deformities of the knee varies with the degree and type of contracture. Lengthening of contracted tendons and severing of the posterior capsule is usually necessary. If there is bony ankylosis, a wedge resection or circular osteotomy is necessary before extension can be started. Once the tissues are freed, extension may be carried out by any of the innumerable recognized methods. Great care must be taken that injury to the large popliteal vessels and nerves be avoided during the surgery or when the knee is being extended by mechanical means.

The author has found the hinged plaster cast to be the most simple and efficient aid in the correction of the deformity, since it not only corrects the flexion deformity, but prevents posterior subluxation during the procedure, and tends to correct the luxation which is usually present. These results are obtained by placing the axis of the hinges anterior to the axis of the knee joint, which produces an anterior thrust on the tibia.

Haas reports 4 cases of severe contracture of the knee joint, 1 of the congenital type, 1 secondary to osteomyelitis of the tibia, and 2 following severe burns. Prior to treatment the patients were unable to walk without some mechanical aid. In all of the cases Haas fulfilled his aim, i.e., he produced a straight, weight-bearing extremity and conserved the extremity. He used the methods described and skin grafts to cover the skin defects produced during the procedure.

DANIEL H. LEVINTHAL, M.D.

Levine, M. A. An Operative Technique for Hallux Valgus. *J. Bone & Joint Surg.*, 1938, 20: 923

A new operative technique which has been used in 10 cases of hallux valgus is presented. It utilizes the tendon of the extensor hallucis longus as a direct antagonist to the oblique and transverse heads of the adductor hallucis muscle. The articular cartilage of the first metatarsophalangeal joint is undisturbed. Follow-up on one case treated in this manner two years previously revealed a painless joint with full range of motion and no recurrence of deformity. The operative technique is as follows:

Through an S-shaped incision made dorsomedially over the level of the first metatarsophalangeal joint, the bursa and the capsule covering the bony exosto-

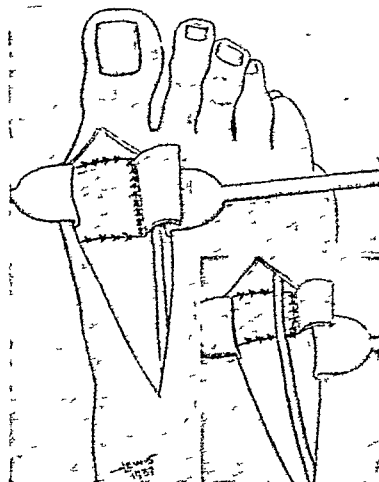


Fig 1

Fig 2

sis is exposed. The bursa is partially dissected from above downward, which exposes the dense fibrous capsule of the first metatarsophalangeal joint. Through an H-incision, the parallel cuts being made near its proximal and distal insertions, the capsule is incised and reflected to expose the bony excrescence. This exostosis, together with the medial base of the proximal phalanx, is removed and the surfaces are smoothed. The previously taut capsule is then redundant, and may be imbricated. The flap which previously covered the exostosis is turned laterally and sutured in place. The extensor hallucis longus tendon, inclusive of the paratendon, is then freed and, without disturbing its insertion, is translocated medially to its new bed (Figs 1 and 2). The remaining flap is reflected medially over the tendon and sutured so as to make a canal. During the entire suturing process, an assistant holds the great toe flexed. The skin is closed and a tongue-blade splint is applied for immobilization of the joint.

After fourteen days the splint is removed and physical therapy in the form of active and passive motion under water, followed by gentle massage, is instituted.

PAUL C. COLONNA, M.D.

FRACTURES AND DISLOCATIONS

Santy, P., Colson, P., Hustinx, E., Topa, P., and Others. Fractures of Both Bones of the Forearm (Les fractures des deux os de l'avant-bras). *J. internat. de chir.*, 1938, 3: 477, 497, 519, 535, 559, 571.

The authors take part in a symposium on fractures of both bones of the forearm.

Santy and Colson believe that these fractures should be treated by open reduction as soon as closed methods have failed. No time should elapse during which large hematomas may form and hemorrhage infiltrate the contiguous muscles. They suggest that during the operation the patient should lie

prone with the arm resting on a board in 90 degrees of abduction and the palm of the hand on the table. They believe that with this position both bones can be approached with a minimum of manipulation. In their hand the open method with metal plate fixation has given the best results.

Hustinx after an analysis of the fundamental causes of displacements in these fractures rejects as impractical all forms of extension treatment whether skin or skeletal. He states and reports on 85 cases to substantiate his claims that if manual reduction with plaster immobilization fails, an open operation with metal plate fixation should be done.

Topa after studying 26 cases states that in no other fracture is exact anatomical reproduction so important. A vicious callus is the dreaded complication which will limit the rotatory action of the fore arm and this can be avoided by accurate approximation of the fragments. He prefers to use an intramedullary bone graft with a Jacoei Dujaner clasp (a form of tap) which is removed about three weeks after the operation.

Stulz and Jung support the other authors who feel that an open plating operation should be done when the preliminary closed procedure has failed.

Jacobovici from a somewhat limited experience states that he has had occasion openly to reduce and plate 4 cases with excellent results.

Griswold prefers a closed reduction with an apparatus which exerts traction on the extended fingers by means of metal spring traps and with the elbow at right angles counter traction against the anterior surface of the arm. This reduction is accomplished under fluoroscopic or roentgen ray control and plaster fixation is used after the reduction is seen to be satisfactory. In the application of the plaster, dowel pins are placed over the interosseous space in order that the plaster is molded down between the bones. Griswold does not speak of the percentage of failures or how many cases came to open reduction. JAMES K. STACE, M.D.

Logroschino D. Biological Resources of the Proximal Fragment in Fractures of the Neck of the Femur (*Le risorse biologiche dell'epifisi femorale superiore fratturata*). *Chirurgia organica* 10: 101, 1938, 23, 55.

In young adults and in adults not too advanced in age the proximal fragment remains alive frequently up to five years after the fracture of the neck of the femur. In the aged or in debilitated individuals the proximal fragment remains alive only if the trauma has spared some of the nutrient vessel or if revascularization has occurred. Similarly as in cases of osteochondritis dissecans the synovial fluid serves for a period of time to nourish the proximal fragment. If during this period of time the fracture is adequately opposed and held in reduction mechanically this fragment may actively participate in the process of repair.

The author presents in detail 2 cases of his own in patients aged seventeen and twenty two respectively.

and reviews 3 other cases from the literature in patients aged thirty, thirty two and forty two years respectively. A brief discussion is presented with regard to factors which influence the revascularization and sustained viability of the proximal fragment. CARLO S. SCOPERT, M.D.

Browder N. C. Nailing the Fractured Neck of the Femur with the Aid of the Fluoroscope. *England J. Med.* 1938, 219, 296.

The immediate treatment for fractures of the femoral neck advocated by the author is the administration of morphine and atropine and manual traction plus internal rotation followed by the application of adhesive traction on the lower extremities and a Thomas splint with from 5 to 8 pounds pull on the affected side. These procedures will lessen the shortening, stop hemorrhage and mitigate shock, pain and muscle spasm.

The ideal time for the operation is on the second or third day after the fracture. Pre-operative barbiturates and morphine are contraindicated because they increase the possibilities of cardiac decompensation and pneumonia. Fifty mgm. of novocaine and 5 mgm. of pontocaine are given as a spinal anesthetic. Local anesthesia is not used because it takes longer to become effective, does not give complete muscular relaxation, adds more fluid to the operative field and does not prevent pain when the nail is driven into position.

Reduction of the fracture should be gentle. A forceful manipulation increases hemorrhage, injures the soft tissues and may cause shock and death. The maneuvers used for the reduction of the fracture are modification of Leadbetter. The surgeon stands at the outer side of the injured leg, grasps the front of the ankle with one hand and flexes the knee to a right angle over his forearm. The hip is then flexed to a right angle and internally rotated while traction is applied. Held in this position the lower extremity is carried inward toward the other leg until the surgeon's hand on the ankle has passed over the uninjured leg. With traction sustained the injured leg is gradually rotated inward and extended until it lies on the fluoroscopic table in 15 degrees of internal rotation. The hip is then abducted 20 degrees and held in this position by an assistant who applies traction force throughout the operation except while the lateral view roentgenograms are being taken following the insertion of the Kirschner wires and at the conclusion of the operation.

Only an anteroposterior view is taken immediately following the reduction. Reduction is also checked however by measurements for shortening and with the fluoroscope. The hip area is prepared and a Kirschner wire is drilled through the femoral neck to within 1 cm. of the cartilaginous surface of the head as guided by the fluoroscope. A second wire is inserted in a similar manner and the one in this satisfactory position is allowed to remain as a guide for the flanged nail. The length of the nail to be used is determined by a Kirschner wire of the same length.

which is pushed down to the bone through the opening out of which projects the guide wire. The second wire will protrude beyond the guide wire by the same distance as the length of the guide wire within the bone. A nail 0.5 cm. shorter than this is chosen to allow for shortening by impaction.

A 2 cm. incision is made through which the nail is pushed down to the bone. It is then driven into within 1 cm. of the articulating surface of the femoral head as shown by the fluoroscope. Anteroposterior and lateral roentgenograms are taken immediately following the operation, but lateral views should not be repeated with the leg in the "frog position" for several months because this position tends to loosen the nail.

The patient is allowed to sit in a chair on the third postoperative day if the pain has subsided. A

Thomas splint and crutches are used during the first two or three months. The Thomas splint is used for a total of four or six months after the operation, following which crutches are again used until the eighth to the tenth month. The results in 53 cases treated between June, 1935, and April, 1938, serve as the bases of this report. Perfect reduction was obtained in 49 cases. The end-results in the 42 patients who survived the operation and postoperative complications are reported as follows: excellent functional results in 24, fair results in 13, and poor results in 5.

The patients were up with crutches on an average of seventeen days, out of the hospital on an average of thirty-seven days, and bearing their full weight on an average of nine and four-tenths months.

ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Reld M R and McGuire J Arteriovenous Aneurysms *Ann Surg* 1933 103 643

In 1925 Reid published a series of four articles on arteriovenous aneurysm in which the literature of the subject was rather extensively reviewed. The view was expressed that there was no essential difference except in the size and number of arteriovenous fistulas between angiomas, cirroid aneurysms and arteriovenous aneurysms. In this report the authors present another series of cases (30) and discuss their clinical observations and surgical procedures. None of the 12 cases reported in detail in this article has ever been published before.

An analysis of 21 cases of arteriovenous and 9 cases of cirroid aneurysms is presented which is supplemented by observations upon experimentally produced arteriovenous aneurysms in dogs. Sixteen of the arteriovenous aneurysms were operated upon and all of them except 1 case of pulsating exophthalmos were cured. In 2 instances the aneurysms healed spontaneously without operation. Four patients failed to return for later operations and could never be traced. All of the 9 cirroid aneurysms were operated upon, 3 were cured and the 6 others were more or less improved. There were no deaths in the entire series of 30 cases.

Clinical and experimental observations which may throw some light upon the physiological and pathological effects of arteriovenous fistulas are discussed in some detail. The principal effects noted and studied were: 10 instances of cardiac damage; 11 instances of thinning and dilatation of the proximal artery; changes in the circulation time in 6 patients; changes in the blood volume in 3 patients; 10 instances of Brannan's bradycardiac phenomenon; 13 instances of blood pressure alterations; changes in the venous blood pressure of 9 patients; 9 instances of markedly increased collateral circulation; 5 instances of impairment of the circulation peripheral to the fistula; 5 instances of an increase in the size and length of an extremity; 4 instances of a associated nerve paralysis; 2 instances of double arteriovenous fistula; and 2 instances of spontaneous healing of the aneurysm.

In their clinical and experimental observations the authors could not confirm Holman's findings of a marked increase of the total circulating blood. A venturimeter was used in some of the experiments to measure the flow of blood in the femoral vein. The writers present an easy method of making an arteriovenous fistula which can be alternately closed and opened.

Unless immediate or early operations are required because of hemorrhage, dangerous hematoma or infection or rapid cardiac damage, the authors believe it wise to postpone operation for from three to six

months after the occurrence of the fistula. During this period hemorrhage becomes absorbed, tissues are restored to normal, danger of infection is lessened and the collateral circulation becomes so extensive that there need be no hesitancy to sacrifice the involved vessels at the time of operation. During the period of time that operation is being delayed, more effort should be made to improve the chances of spontaneous healing. A long period of rest in bed with elevation of the affected part and limitation of the fluid intake and possibly bleeding soon after the accident might result in more spontaneous cures.

The essential thing in the operative cure of arteriovenous and cirroid aneurysms is the elimination of all possibilities of any blood ever again passing through the fistula. To close a fistula with restoration of the vein and artery would appear at first thought ideal and physiological. However, in many cases closure has been followed by serious pulmonary complications due to embolisms of air and blood clots from thrombosis at the site of operation. The ligation of the involved veins probably results in a better balance between the arterial and venous bed even though the artery is restored.

When the arterial wall is not atrophied and no danger is anticipated from a sudden restoration of the normal blood pressure, suture of the fistula with restoration of the artery and ligation of the vein may be done. In the late cases in which severe changes have occurred in the proximal artery and there is abundant collateral circulation, the authors do not believe in an attempt to restore the artery. The quadruple ligation of the artery and vein is certain of succeeding only when all the intervening branches are ligated; otherwise the chances of the return of the aneurysm to its previous state are excellent. To ligate the canal of communication is probably dangerous and is rarely possible technically.

Whenever possible extirpation of both vein and artery at the site of fistula with quadruple ligation of the vessels was done. There were exceptions to this procedure in the cases of intracranial arteriovenous aneurysms and certain cirroid aneurysms. Dissection and ligation without a tourniquet is the best choice.

An effective method of assuring the closure of the fistula when the hazards of total ablation appear to be too great is the ligation and division of the involved vessels and transfixion occlusion of the fistula. This procedure was employed in 2 cases and its steps are illustrated.

A new procedure discussed by the authors and effectively employed in 2 cases is the closure of the fistula by means of division and twisting of the vein. Its steps are illustrated. This technique of operation appears to have a definite application in some of those cases in which it is not possible to use any of the other standard curative procedures.

In general, any procedures which do not actually close the fistula are undesirable and may not only fail to cure the aneurysms, but may cause serious circulatory disturbances peripheral to the fistulas. An untold number of limbs have become gangrenous and have had to be amputated because of the simple proximal ligation of the artery. There are some abnormal arteriovenous communications, however, for which it still seems necessary to take the risk of performing a proximal ligation of the artery.

HERBERT F. THURSTON, M.D.

RETICULO-ENDOTHELIAL SYSTEM

Robb-Smith, A. H. T. *Reticulosis and Reticulosarcoma. A Histological Classification.* *J. Path. & Bacteriol.*, 1938, 47: 457.

The author presents a classification of the progressive hyperplasias and neoplasias of lymphoreticular tissue which follows Maximow's hypothesis of the pluripotency of certain primitive cells of the embryonic mesenchyme which persist throughout life.

In his introduction he puts forward a justification for a methodological consideration of the lymphadenopathies. Upon such a framework as he proposes a clinical analysis can be superimposed and search made for causative factors. Further subdivisions may be necessary or certain of those put forward may prove superfluous, but with a classification based on cytology and structure such adjustments are possible without destruction of the main concept. It is only by uniformity of description and a scrupulous use of terms that any advance can be made.

The normal anatomy of the lymph node is described and a classification of the reticuloses presented. Reticulosis is defined as a progressive hyperplasia of reticular tissue with differentiation of one or more cell types. Follicular reticulosis is the hyperplasia of undifferentiated cells in lymph follicles and malpighian bodies of the spleen with the possible reproduction of the follicular structure in the bone marrow and periportal tissue. Sinus reticuloses consist of the hyperplasia of undifferentiated mesenchymal cells and littoral cells in lymph sinuses, sinusoids of the liver, and venous sinuses of the spleen and bone marrow. In some cases tissue histiocytes are also involved. Medullary reticuloses are the hyperplasia of undifferentiated mesenchymal cells in the medullary tissue or pulp of the lymph node and spleen, in the periportal tissue of the liver, and possibly in the interstitial tissues throughout the body. In any of these conditions free cellular

elements may appear in the circulating blood. The classifications with their subdivisions are presented for these reticuloses.

In the consideration of reticulosarcoma, the criterion employed by the author is that this lesion is a proliferation of mesenchymal cells or of their progeny, which results in stromal destruction as well as infiltration. After examining a number of tumors of reticular-tissue origin, he found that the blastomas could on the whole be classified satisfactorily on the basis of their cytological differentiation. The classification suggested by the author is as follows:

- A Undifferentiated reticulosarcoma (syncytial)
 - 1 Diffuse
 - 2 Trabecular (stroma reaction)
- B Differentiation to histioid cells
 - 1 Dictyosyncytial (fibrillosyncytial) reticulosarcoma
 - 2 Dictyocytic (fibrillary) reticulosarcoma
- C Differentiation to hemic cells
 - 1 Lymphocytoma
 - a Lymphoblastic sarcoma
 - (1) Medullary
 - (2) Follicular
 - b Lymphosarcoma
 - 2 "Plasmocytoma"
 - 3 (Monocytoma)
 - 4 Myeloblastoma
 - 5 Erythroblastoma
- D Mixed type (polymorphic reticulosarcoma)
- E Differentiation of sinus lining cells
 - 1 Undifferentiated cell type (reticuloendothelial-sarcoma)
 - 2 Differentiated cell type (histiocytoma)

The author notes that since Gordon's original account of the production of a peculiar form of ataxic paraplegia in rabbits following the intracerebral inoculation of lymphadenomatous material, numerous investigators have confirmed its value in the diagnosis of Hodgkin's disease and the consistency with which control lymph nodes give a negative result. The carrying out of the biological test is simpler than a careful histological examination of a lymph node, but it should aid histological diagnosis and not replace it. In the majority of cases, a histological diagnosis of Hodgkin's disease is not difficult. The main difficulty arises in the distinction between a polymorphic reticulosarcoma and Hodgkin's disease, and it is here that the biological test is of great value. It has constantly been found that polymorphic reticulosarcomas give a negative reaction even when they resemble Hodgkin's disease very closely histologically.

HERBERT F. THURSTON, M.D.

SURGICAL TECHNIQUE

OPERATIVE [SURGERY AND] TECHNIQUE POSTOPERATIVE TREATMENT

Wyllin G. The Practical Applicability of the Cardiopulmonary Function Test *Ido med*
Second 1938 Supp 93

The author uses the term cardiac insufficiency synonymously with heart failure. By decompensation he means congestive heart failure. Schematically two stages of heart failure are described.

Stage I or the latent stage during which the patient in the resting condition does not show any signs of insufficiency.

Stage II in which there are typical symptoms of insufficiency in the resting condition which imply congestive phenomena characterized by venous engorgement, cardiac enlargement, dyspnea at rest, edema and cyanosis.

Stimulated by the investigations of various workers in the determination of latent cardiac insufficiency the author has worked out a method for the determination of the increased oxygen consumption after work. A specially constructed staircase was used for the work in function tests. The oxygen consumption was determined during rest and at a certain fixed time after cessation of work. The increase was then expressed as a percentage of the resting value and this was taken as the basis for estimation of the dyspnea and also the function of the cardiopulmonary system. By the study of a large number of individuals including healthy persons as well as patients with compensated and decompensated heart conditions it was found that the patient with cardiac insufficiency had a larger oxygen consumption than the healthy person at a certain fixed time after the cessation of graduated work.

The practical applicability of the cardiopulmonary function test is discussed in cases of valvular disease, coronary artery disease and pulmonary diseases. The author's apparatus and method for this test are described in detail and illustrative cases are reported. The author has assembled in this work a number of cases in which clinically provable symptoms of insufficiency during rest were usually absent yet by means of the cardiopulmonary function test latent cardiopulmonary insufficiency was demonstrated.

SAMUEL H. KLEIN, M.D.

Chalier A. The Prevention and Abortive Treatment of Postoperative Phlebitis (*La prévention et le traitement abortif des phlébites post-opératoires*) *Presse méd. Par.* 1938 46 1345

Postoperative phlebitis occurs most frequently in obese women over forty years of age who have glandular or cardiorenal disturbances, low blood pressure, a defective venous circulation and in

creased viscosity and coagulability of the blood in which there is alteration due to repeated hemorrhages or a dysfunction of the liver.

The author recommends the following pre-operative prophylactic precautions:

1. Unless the patient has fever and infection she should move around as much as possible before the operation and if she has been confined to bed she should if possible get up and walk for a few hours every day.

2. The blood pressure and the number and rhythm of cardiac pulsations should be recorded and a corresponding treatment of hypoplasia, tachycardia and arrhythmia with an adrenaline, ephedrine or digitalis preparation should be instituted.

3. Unless absolutely necessary, no drugs accelerating blood coagulation should be administered and if the coagulation time is shortened, hirudin and sodium citrate should be given or at least kept at hand to be used after the operation.

4. The organism should be prepared to fight the infection by means of injections of propion or the daily ingestion of septazine or rubrazol.

As to the operation itself, it should be performed in such a manner that all rules of asepsis are strictly observed, hemostasis is perfect, traumatism of the pelvic veins is avoided and no large portions of tissues are ligated. The type of anesthesia, the mode of hysterectomy, total or subtotal and the employment of drainage are of minor importance.

After the operation the patient should leave her bed as soon as possible and in cases out of the ordinary, whatever the character of the intervention has been, the confinement to bed must not last more than forty-eight hours.

The condition of the pulse is of a greater diagnostic and prognostic value than the temperature. The blood pressure and coagulation time should be determined at frequent intervals to disclose the necessity if any of the application of leeches, anticoagulants and cardiac stimulants.

The abortive treatment consists of the following measures:

1. The continuation and intensification of walking, contrary to the classical treatment. This applies to patients in whom menacing signs, such as acceleration of the pulse, elevation of the temperature and pains or swelling of the calf or foot have been noticed. In order to facilitate the walking and to attenuate the pains, a gauze bandage is applied to the calf in the upward direction before the patient leaves her bed. During the night, hot compresses are applied to the leg.

2. Raising of the foot of the bed to facilitate the flow of the venous blood.

3. The administration of cardiac stimulants and pressor substances.

4 The administration of large doses of anti-coagulants, such as from 4 to 6 gm of sodium citrate or hirudin. The author places 2 or 3 blood leeches on the thighs close to the inguinal region, daily or every second day. The employment of the treatment outlined for ten years enabled the author to avoid the development of phlebitis with all its sequelae. Among 200 patients who had been operated upon, 50 showed signs of an incipient phlebitis, the evolution of which was stopped by the abortive treatment. The complication did not prolong the duration of hospitalization and did not retard the convalescence. The method is efficient only if used as soon as possible after the detection of the first symptoms, and is not recommended by the author if the condition has not been recognized early enough or if it involves the entire lower extremity. JOSEPH K. NARAT, M.D.

ANESTHESIA

Thomas, G. J. : Technique of Intubation Anesthesia with Detailed Illustration. *Anes & Anal*, 1938, 17, 301

Endotracheal and intratracheal are two terms identifying the same type of anesthesia. It is suggested that the word endotracheal be used for that type of anesthesia in which the tube is passed through the nose and into the upper part of the trachea, and the word intratracheal for that type in which the tube is passed through the mouth and into the middle of the trachea. This type of anesthesia is useful in intrathoracic operations, operations about the head and neck in general, intra-oral operations, such as excision of the tongue, and removal of the lower jaw and cleft palate, operations on the trachea and larynx, in cases in which vomitus may collect in the upper air passage, as in emergency operations for intestinal obstruction, in prolonged operations, and in cachectic individuals. Shock appears to be rare in patients anesthetized by this method. This anesthesia is also useful in orthopedic and neurosurgical procedures, both to maintain anesthesia and an adequate airway when the patient is in the prone position. It is indicated especially for tonsillectomy on an obese patient who possesses a small mouth, deep pharynx, and large tongue.

This type of anesthesia should not be used in poor risks, in cases in which instrumentation and trauma may be a hazard, in acute inflammatory or suppurative disease or in cases with growths in the larynx or other surrounding tissue, in toxic thyroid disease, except when pressure upon the trachea causes respiratory embarrassment, and in conditions in which deep anesthesia is contraindicated as deep anesthesia is needed for intubation.

Premedication with a fair dose of atropine administered about thirty minutes before induction of the anesthesia is desirable. In neurosurgical cases in which the vital centers are depressed because of increased intracranial pressure, it is advisable to omit opiates and barbiturates. When contraindications are absent, morphine with either atropine or

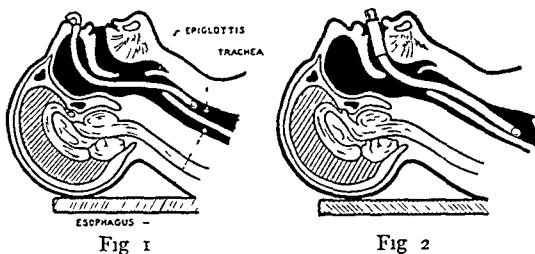


Fig 1

Fig 2

Fig 1 Magill tube in proper position, using the intranasal intubation. Note metal elbow at proximal end of tube. This adapter is used to keep the tube from traversing into nose beyond reach for extubation. It also can be used to attach to anesthetic equipment.

Fig 2 The intratracheal tube in proper position in the trachea.

scopolamine should be given forty-five minutes before operation. Recently a basal dose of avertin thirty minutes before operation in addition to morphine and atropine was administered. Preliminary cocaineization is unnecessary. The patient is anesthetized to the stage in which the mandible is relaxed. The head is extended and a well lubricated Magill curved rubber catheter (sizes from 22 F to 30 F) is passed along the floor of the nose close to the septum. When a point is reached where the respiratory sounds are heard with maximum intensity the tube is inserted onward only during inspiration. If the tube is in the trachea breath sounds will be audible at the outer end. In some instances it may be necessary to use a tongue depressor, exert traction on the tongue, or employ forceps with the aid of a laryngoscope to assist in the placing of the tube into the trachea (Fig 1).

For oral intubation deep anesthesia is necessary. Suction is employed to remove mucus from the pharynx. A mouth gag prevents biting of the tube. A laryngoscope is passed until the epiglottis is in view. The lubricated intratracheal tube is then passed without force through the vocal cords (Fig 2). Apnea may last for from twenty to thirty seconds, after which breathing is quiet.

For simple intubation it is essential that there be good muscular relaxation. The tube should be well lubricated and of proper size. Every apparatus should have a safety or blow-off valve to act as a safeguard against temporary or prolonged overpressure which might injure the lung. Trauma to the teeth, pharynx, and larynx should be avoided. Extubation should be done gently. Under light anesthesia laryngospasm may make removal of the tube difficult. Deeper anesthesia should be induced before an attempt is made to remove the tube in such instances. MANUEL E. LICHTENSTEIN, M.D.

Lorhan, P. H. The Determination of Acetone in Expired Air. Its Value in Anesthesia and the Surgical Patient. *Anes & Anal*, 1938, 17, 316

Using the Roth method for the determination of acetone in the breath, the author studied a series of

SURGICAL TECHNIQUE

OPERATIVE [SURGERY AND] TECHNIQUE POSTOPERATIVE TREATMENT

Nylin G. The Practical Applicability of the Cardiopulmonary Function Test *Acta med Scand* 1938 Supp 93

The author uses the term cardiac insufficiency synonymously with heart failure. By decompensation he means congestive heart failure. Schematically two stages of heart failure are described.

Stage I or the latent stage during which the patient in the resting condition does not show any signs of insufficiency.

Stage II in which there are typical symptoms of insufficiency in the resting condition which imply congestive phenomena characterized by venous engorgement, cardiac enlargement, dyspnea at rest, edema and cyanosis.

Stimulated by the investigations of various workers in the determination of latent cardiac insufficiency the author has worked out a method for the determination of the increased oxygen consumption after work. A specially constructed staircase was used for the work in function tests. The oxygen consumption was determined during rest and at a certain fixed time after cessation of work. The increase was then expressed as a percentage of the resting value and this was taken as the basis for estimation of the dyspnea and also the function of the cardiopulmonary system. By the study of a large number of individuals including healthy persons as well as patients with compensated and decompensated heart conditions it was found that the patient with cardiac insufficiency had a larger oxygen consumption than the healthy person at a certain fixed time after the cessation of graduated work.

The practical applicability of the cardiopulmonary function test is discussed in cases of valvular disease, coronary artery disease and pulmonary disease. The author's apparatus and method for this test are described in detail and illustrative cases are reported. The author has assembled in this work a number of cases in which clinically provable symptoms of insufficiency during rest were usually absent yet by means of the cardiopulmonary function test latent cardiopulmonary insufficiency was demonstrated.

SAMUEL H. KLEIN, M.D.

Challier A. The Prevention and Abortive Treatment of Postoperative Phlebitis (La prévention et le traitement abortif des phlébites post-opératoires) *Presse méd* Par 1938 46 1345

Postoperative phlebitis occurs most frequently in obese women over forty years of age who have glandular or cardiorenal disturbances, low blood pressure and defective venous circulation and in

creased viscosity and coagulability of the blood in which there is alteration due to repeated hemorrhages or a dysfunction of the liver.

The author recommends the following preoperative prophylactic precautions:

- 1 Unless the patient has fever and infection she should move around as much as possible before the operation and if she has been confined to bed she should if possible get up and walk for a few hours every day.

- 2 The blood pressure and the number and rhythm of cardiac pulsations should be recorded, and a corresponding treatment of hypotension, tachycardia and arrhythmia with an adrenal or ephedrine or digitalis preparation should be instituted.

- 3 Unless absolutely necessary no drugs accelerating blood coagulation should be administered and if the coagulation time is shortened hirudin and sodium citrate should be given or at least kept at hand to be used after the operation.

- 4 The organism should be prepared to fight the infection by means of injections of propion or the daily ingestion of septazine or rubiazol.

As to the operation itself it should be performed in such a manner that all rules of a sepsis are strictly observed, hemostasis is perfect, traumatism of the pelvic veins is avoided and no large portions of tissues are ligated. The type of anesthesia, the mode of hysterectomy, total or subtotal and the employment of drainage are of minor importance.

After the operation the patient should leave her bed as soon as possible and in 9 cases out of 10 no matter what the character of the intervention has been, the confinement to bed must not last more than forty-eight hours.

The condition of the pulse is of a greater diagnostic and prognostic value than the temperature. The blood pressure and coagulation time should be determined at frequent intervals to disclose the necessity if any of the application of leeches, anti-coagulant, and cardiac stimulants.

The abortive treatment consists of the following measures:

- 1 The continuation and intensification of walking contrary to the classical treatment. This applies to patients in whom menacing signs such as acceleration of the pulse, elevation of the temperature and pains or swelling of the calf or foot have been noticed. In order to facilitate the walking and to attenuate the pains a gauze bandage is applied to the calf in the upward direction before the patient leaves her bed. During the night hot compresses are applied to the leg.

- 2 Raising of the foot of the bed to facilitate the flow of the venous blood.

- 3 The administration of cardiac stimulants and pressor substances.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Grilli, A. The Roentgenological Aspect of Beginning and Advanced Gas Gangrene (L'aspetto radiologico della gangrena gassosa iniziale ed avanzata) *Radiol med*, 1938, 25 843

Roentgenological examination in beginning cases of gas gangrene is valuable because it reveals signs of the disease before crepitation is found. In order to demonstrate the presence of gas, bandages and appliances which may prevent distinct visualization of the soft parts must be removed from the extremity. The roentgenological aspect of gas infection is characteristic and varies according to the tissues which are invaded, an alveolar and reticular appearance is found in the connective tissue, thin longitudinal streaks in the interstices of the muscles, and striations reproducing the muscular fibers in the muscle itself (Fig 2), in gaseous phlegmon there are an accumulation and superimposition of gaseous bullæ. The development of experimental gas gangrene has been divided into three stages (1) muscular swelling with a clear zone of irregular contour along the infected tract, (2) diffusion of gangrene with the presence of gaseous streaks indicating the fascicular structure of the muscle, and (3) enlargement of the clear spaces and the presence of large gaseous bullæ with irregular contours in the individual muscles.

Grilli reports 3 cases of gas gangrene studied roentgenologically. In the first case, in which a complicated fracture of the left tibia and fibula resulted from an automobile accident, crepitation was discovered in a limited part of the anterior aspect of the lower third of the left thigh, and roentgenological examination disclosed the presence of a circumscribed collection of gas, resulting from the confluence of rather large bullæ, and of smaller round and isolated bullæ above and below the principal collection. These findings indicated the possibility of incipient gas gangrene. No sign of infiltration of air or gas was found at the site of fracture or in the soft tissues below the patella (Fig 1). High amputation of the thigh saved the patient's life.

The 2 other cases of gas gangrene were fatal and occurred in soldiers who sustained bullet wounds of the calf of the leg, they presented the typical roentgenological appearance of gas gangrene previously described. It is to be noted that in both cases there was an ordinary bullet wound involving only the soft tissues and that, although no arteries were severed, the circulation of the foot and of the lower part of the leg was blocked by the gaseous distention of the extremity.

In advanced cases, all the soft tissues of the various planes of the extremity are infiltrated with gas, in less advanced cases, the infiltration is limited to the muscles of certain aponeurotic compartments. The infiltration follows the anatomical routes. In



Fig 1

roentgenological examination, gas collections in a wound may be distinguished from air collections, since the latter appear as large collections without internal structure and show no spreading around the collection, as denoted by the absence of small peripheral bullæ. Negative images of short duration may be caused by irrigation with hydrogen dioxide. Roentgenological examination is indicated in all cases in which gas gangrene is suspected, it reveals the extent of the infiltration and furnishes the necessary surgical indications within a few minutes and without the necessity of special technical refinements.

RICHARD KEMEL, M D

Giurlo, L., and Oliveri, A. The Technique and Results of Roentgenography of the Larynx in Anteroposterior Exposure (Tecnica e risultati della radiografia del laringe in proiezione antero-posteriore) *Radiol med*, 1938, 25 834

The authors recommend the method of roentgenography proposed by Réthi in 1914, which consists of the introduction of the roentgen film into

92 patients for postoperative acidosis. The patients included in this series had been operated upon for various conditions and several different types of anesthesia had been employed.

The following are the author's conclusions:

1. Patients undergoing emergency operations develop acetone in greater amounts and more often than those submitting to elective surgery.

2. Children are more prone to develop acetone than adults and females more prone than males.

3. Acetone develops oftener and in greater amounts after the administration of anesthesia in which ether has been used than following straight nitrous oxide oxygen.

4. Trauma is a marked factor in the production of acetone. This was noted especially in the patients who underwent intraperitoneal surgery while in those undergoing extraperitoneal surgery the development of acetone was decreased.

5. A simple remedy for the prevention of acetone is the pre-operative administration of fruit juices with glucose solution. After operation the administration of 5 per cent saline glucose solution will reduce the amount of acetone present and if acetone remains marked after twenty-four hours the intravenous injection of 50 c.c. of 50 per cent glucose solution is usually remedial. This treatment may be

repeated twelve hours later if necessary. In children glucose may be supplied in the form of hard candy which is usually enjoyed and very well tolerated.

6. The general condition of surgical patients improve much more readily if the production of acetone can be prevented or kept negligible in amount.

SAMUEL H. KLEIN, M.D.

Bellman J. L., Svirbely J. L. and Mann F. C.
Blood Concentration Influenced by Ether and Amytal Anesthesia. *Surgery* 1935 4: 831.

The dilution of the corpuscular elements of the blood during sodium amytal anesthesia is produced by the abstraction of red cells from the circulating blood by the spleen and by an increase in the fluid of the plasma. In the absence of the spleen, the dilution of the plasma is of similar magnitude as in the intact animal. Ether anesthesia produces an increase in the total circulating red cells apparently by extrusion of these cells from the spleen and also by diminution of the volume of circulating plasma. In the absence of the spleen fewer cells are added to the circulation but the reduction of plasma volume seems independent of the spleen. It was obvious in a number of experiments that the volume of circulating plasma and cells may be altered by capillary beds other than those of the spleen.



Fig 1



Fig 2



Fig 3

Fig 1 Radiography Fig 2 Tomography at 6 cm on dorsal plane Fig 3 Tomography at 9 cm on dorsal plane

focal plane have a clear or distinct representation. Using this method one is able to make a number of sections at different levels.

Six cases are discussed in detail. In each case the ordinary flat plate roentgenogram is first considered, then the tomographic sections taken at the levels as indicated are considered and discussed and are found to bring out the pathological lesions quite clearly.

In the first case presented, the ordinary roentgenogram of the chest showed the cardiopericardial shadow contracted to the right. The right side of the chest showed a uniform density equal to that of the liver through which it was impossible to diagnose adjacent pathology. It was therefore impossible to recognize the outline of the suspected cavities in the right apex.

A study of the tomographs taken at the 6, 9, 12, and 15 cm levels is discussed. The section taken at the 9 cm level showed two distinct cavities, the pathology of which was much more thoroughly outlined than in the ordinary roentgenogram of the chest.

Tomographs are especially valuable for selection of the treatment. In particular they are of great value in the determination of the depth and size of the cavities in question, and of whether or not adjacent cavities are separated by good pulmonary tissue.

Tomography is a procedure by means of which localization may be carried out in the depth of the tissue. The tomograph literally cuts the thorax at the desired level. Each of the sections is fixed with relation to the frontal plane of the subject.

The authors are of the opinion that another great step has been made in the method of diagnosis of chest lesions. They suggest that the physical signs as brought out by inspection, palpation, percussion, and auscultation have been enhanced further by flat roentgenography of the chest. Now the latest de-

velopment and advance in chest work, they believe, is tomography, which presents great possibilities of bringing into evidence lesions which heretofore have not been suspected. The method has not been perfected as yet and much remains to be done in this very valuable work. RICHARD J. BENNETT, JR., M.D.

Bullo, E. . Roentgenological Changes of the Mucosa in Neoplasms of the Stomach (Le alterazioni radiologiche della mucosa nelle neoplasie dello stomaco) *Tumori*, 1938, 24, 407

The studies of Forssell have shown that the formation of gastric folds is due to the contraction of the muscularis mucosae, the degree of imbibition of the mucosa, and the contraction of the muscular layer itself. The presence of gastric folds is best demonstrated by the use of a small quantity of opaque solution, which causes the appearance on the roentgenogram of alternating clear and dark lines of varying aspect according to the part of the stomach under consideration. The folds along the middle portion of the lesser curvature and of the anterior and posterior walls run parallel to the axis of the stomach and are straight or slightly wavy, while most of the folds at the beginning of the antrum run perpendicularly or obliquely to this axis, arriving at the greater curvature, a few in the proximity of the lesser curvature run parallel toward the pylorus. The folds present a reticular aspect over the fundus. In the roentgenological evaluation of the mucosal relief, the elasticity, size, course, continuity, and disposition of the folds must be taken into consideration, as well as the changes produced by posture, compression, degree of filling, and superimposition of the anterior and posterior walls.

The changes in size, elasticity, and course of the gastric folds constitute the basic signs which permit recognition of alterations in the mucosa, and palpation under the roentgenoscope in cases of hardness



Fig 1



Fig 2

Fig 1 Anteroposterior roentgenogram of normal larynx with open glottis (1) hyoid bone (2) piriform recess (3) epiglottis (4) arytenoid eminence (5) upper margin of the thyroid cartilage anterior wall (6) ventricular folds or false vocal cords (7) Morgagni's ventricle (8) vocal cords (9) intermediate calcified portion of the thyroid cartilage (compass needle) (10) shield of the cricoid (11) base of the arytenoid and (12) subglottic plane

Fig 2 Roentgenogram of the same subject as in Figure 1 with closed glottis

the hypopharynx in order that roentgenograms of the larynx may be obtained. On a model made of aluminum measuring 9.5 by 4 cm. the sides of which fall away to form a rounded extremity after a straight course of 3.5 cm. they cut the roentgen film to size in the dark room and place it into an appropriate black paper envelope together with a piece of tin foil on the back of the film to obtain reinforcement of the image. The upper angles of the film are rounded to facilitate removal from the pharynx and the left angle is cut down more than the right to make recognition of this side easy. A thin layer of paraffin is applied to the envelope to insure impermeability. The hypopharynx of the patient is anesthetized by the use of an atomizer containing the usual 5 per cent cocaine or 2 per cent percaine solution. The patient is placed in the supine position with a cushion under the shoulders to extend the neck and the film is introduced as low as possible in the hypopharynx by means of forceps care being taken to maintain the film exactly transverse to the larynx. Soft rays are used to obtain good roentgenograms from 42 to 46 kv. 60 ma. 40 cm. focus distance and an exposure time varying between two tenths and one twentieth of a second are used.

It is evident that all the laryngeal components cannot be demonstrated on a single roentgenogram of an individual patient especially the cartilaginous parts are not apparent unless they are calcified. However the study of various roentgenograms of different subjects will permit the identification of all laryngeal parts whether they are cartilaginous or musculomembranous. Pictures obtained in pachydermia of the larynx with eversion of the ventricles in tuberculo-sis of the larynx and in pressure of the abductors are presented for comparison with those of a normal subject aged twenty-eight years

Fig 3 Extensive tuberculous infiltration of the larynx with nearly complete stenosis (1) hyoid bone (2) epiglottis (3) endolaryngeal infiltrative process (4) thyroid cartilage largely calcified (5) shield of the cricoid with its ring and (6) base of arytenoid

showing the phases of open and closed glottis (Figs 1 and 2). In this subject the cricoid cartilage and the intermediate part of the thyroid cartilage between its two lateral portions are already calcified and part of the lower margin of the thyroid cartilage and the bases of the arytenoids can be recognized as well as the thyrohyoid ligament the piriform recesses the epiglottis the arytenoid eminences the ventricular folds Morgagni's ventricles and the vocal cords. In the case of a patient who has proliferating laryngeal tuberculosis with nearly complete stenosis due to invasion of the supraglottic and glottic planes by the specific process the entire cricoid cartilage is visible because it is completely calcified while the thyroid cartilage is only partially visible and the bases of the arytenoids are hardly demonstrable (Fig 3).

RICHARD KEMEL, M.D.

Malingot G and Bernard E. Research of the Pulmonary Cavities by Tomography (*A la recherche de cavités pulmonaires par la tomographie*). *Arch. méd.-chir. de l'appar. resp.* 1937 1: 425

It is a well known fact that the ordinary flat plate roentgenogram of the chest does not always reveal all which one might desire. An x-ray of the chest is really a superposition of images situated in the different planes. The images are made up both of physiological and pathological factors the clavicles the scapulas the ribs the spine the heart the liver and other viscera are all combined in the physiological images. Many times there are homogenous shadows in the midst of which a cavity cannot be isolated analyzed or ever suspected.

There are 2 types of lesions which are recognized (1) those in which multiple spots give an impression of a diffuse infiltration and (2) those in which a uniform density gives the impression of either a pleural effusion or a fibrothorax.

The new method is known as tomography. This method permits the identification of a thin section of the thorax wherein only the images situated in that



Fig 1 Roentgenography of the gall bladder, immediately following its extirpation. A densely calcified concrement lies in the center of the gall bladder, round about this are a number of smaller concretions, most of them with clearly discernible, central, star-shaped figures of lessened density

Such central cleft formation has, of course, already been discussed in the literature, but so far as the author knows, no one has pointed out its significance for diagnosis, and this rarely observed phenomenon is therefore proposed by the author as a new roentgen-symptom in cholelithiasis (the symptom of the transparent gall-stone cleft formation)

JOHN W BRENNAN, M D

Westermarck, N , and Forssman, G The Roentgen Diagnosis of Tuberculous Spondylitis *Acta radiol*, 1938, 19 207

This is a study based on 275 cases of tuberculous spondylitis observed between the years 1930 and 1936, in the roentgen department of St Gorans sjukhus in Stockholm. One hundred and eight of the cases showed changes which were relatively recent, and these were allotted special study

Of these 108 early cases, 60 presented changes which were sharply localized and 48 changes which were diffused throughout the greater portion of the vertebral body. Most of the patients in the first group (56) were more than fifteen years of age and 46 were more than twenty, on the other hand, more than half of the patients in the second group (29) were less than ten years of age and 36 were less than twenty years

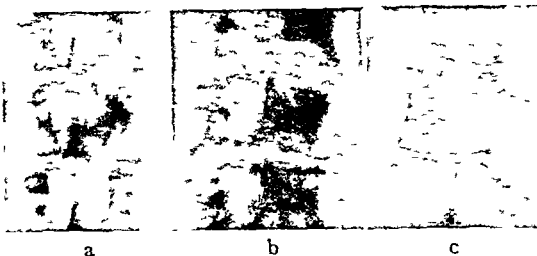


Fig 1 Case of focal osteitis. Prominent periosteal deposits

Of the 60 localized lesions 48 were located in the anterior portion of the vertebral body and 36 were in the lower portion, only 9 were located posteriorly, and of these 5 were located in the lower portion. The remaining 2 were located in the base of the transverse arch.

Since nearly all of these lesions were placed laterally, an oblique roentgen exposure (at 45 degrees to the sagittal plane) was recommended in addition to the regular anterior and lateral views, as it would more satisfactorily isolate the lesion on the plate for study of the processes of osteosclerosis and periostitis. By this means the author was able to distinguish two different types of focal spondylitis: the one a circumscribed osteosclerosis with periosteal deposits, and the other a type with formation of sequestrum and a rarefied border zone.

An example of the advantages of the oblique view is seen in Figure 1b. JOHN W BRENNAN, M D

Massari, G M Difficulties in the Roentgenological Diagnosis of Osteosarcoma (*Difficoltà nella diagnosi radiologica dell'osteosarcoma*) *Radiol med*, 1938, 25 598

Massari states that among the many neoplastic processes involving the skeleton, the malignant connective-tissue tumors present insurmountable diagnostic difficulties. Osteosarcoma is perhaps the most commonly observed primary tumor of bone, and it appears under so many varied aspects that the correct diagnosis can be made only by a person who has considerable experience in this field.

In this article the author bases his conclusions primarily upon the observation of a series of patients with osteosarcoma. He believes that first of all every patient should be studied as carefully as possible from a clinical point of view. The individual roentgen films should be taken as accurately as possible and should be read by a roentgenologist who has had a great deal of experience with these pathological processes. The interpretation of the film is often difficult, primary osteosarcoma should be differentiated from secondary metastatic neoplasms and from certain inflammatory processes as they are observed in lues, osteomyelitis, and periostitis.

There are a few anatomicopathological features, however, which may be of considerable diagnostic aid in the interpretation of roentgen films, such as

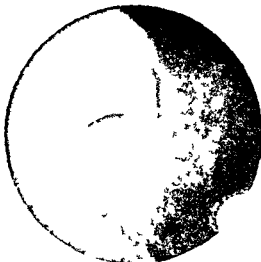


FIG. 1. Prevailing vegetating carcinoma with superficial ulceration of the neoplastic tissue which recalls the image of a niche



FIG. 2. Small polyp of the prepyloric region with well defined contour and regular contour of the folds around it

and rigidity of the folds is a valuable help. In carcinoma the degree of integrity of the mucosa will serve to distinguish ulcerating from non ulcerating tumor but the mucosa does not always present a typical relief for each form and various combinations may be encountered. In vegetative carcinoma the normal design of the folds disappears and is replaced by transparent areas cut up by irregular folds with spots that recall grossly the aspect of a niche (Fig. 1). At times through the disappearance of all relief the stomach appears as if coated with a thin layer of barium. In well defined ulcerating carcinoma the roentgenogram shows a central niche an evident delimitation of the tumor at the periphery and clear cut interruption of the folds at the neoplastic contour. Study of the mucosal relief is more important in malignant tumors which from the beginning evolve in the form of ulcer and present a great similarity to benign ulcers. In both there may be a halo at the base but it is constant appears under the slightest compression and is of irregular shape in malignant ulcer it is due to edema of the mucosa in benign ulcer. In half of the cases of scirrhus carcinoma there is complete disappearance of relief or an irregular and interrupted course of the folds but the alterations of the mucosa are not characteristic of the disorder. Of particular importance in the diagnosis of carcinoma is the presence of folds of irregular size alternating with normal folds between which the opaque solution runs in irregular rivulets.

The signs which permit a diagnosis of sarcoma are the persistence of peristalsis in the presence of marked filling defects with multiple localizations the possibility of displacement of the viscus the absence of stenosis and the aspect of the mucosa

which resembles that found in benign tumors in the majority of cases.

Polyps are the most frequent benign gastric tumors and vary in size and location. The roentgenological signs consist of a filling defect with smooth contour normal relief of the mucosa around the tumor and normal peristalsis (Fig. 2).

In roentgenological examination of the stomach for suspected changes it is necessary to determine the seat of the lesion to establish its extent and to recognize its nature. These three problems are best solved by the use of a small quantity of opaque solution which is the only means of showing early neoplastic changes and the differentiation between benign and malignant tumors with their chief anatomical characteristics. The tumor's extent gives its limits of operability.

RICHARD KEATL, M.D.

Akerlund A. Transparent Gas-Contained Cavity Formation in Gall Stones and Its Significance for Diagnosis (Ueber transparente gas haltige Spaltbildungen in Gallensteinen und ihre roentgenologische Bedeutung). *Acta rad.* 1933 19 15.

Three cases are reported in which upon roentgen examination of the gall bladder additional concretions to the usual calcareous sediment findings and the heavy stones with dense shadows or at least with denser centers were found. These concretions were floating upon top and showed star shaped central figures of decreased shadow density. When removed they were found to have a specific gravity as low as 1.010 (the specific gravity of pure cholesterol is 1.040) and it is believed because of their lightness and the great brightness of the central figures that they must contain gas (Fig. 1).

der separating the hollow of the neck from the hollow body of the capsule, which provides a passageway for an anchoring linen cord. Latex rubber tubing can be fitted snugly over the corrugated neck of the capsule. The stylet is made of 27-gauge piano steel wire which combines flexibility with rigidity.

In the application of this device the upper and lower levels of the lesion are marked on the patient's chest by means of ink or a skin pencil in order to indicate on the exterior the levels of the lesion for proper placement of the capsule. Before introduction of the capsule the patient abstains from food for four hours, and adequate doses of morphine and atropine are given. The nasopharynx is moderately cocaineized. Two or three radium tubes are fitted to the hollow capsule. The wire stylet is lubricated and thrust into the rubber tubing, so that it lodges upon the shoulder in the capsule. The applicator is inserted with the patient sitting upright and his head completely extended, pressure is brought to bear very gently until the tumor mass is reached. The sensation of the mass is easily transmitted to the finger. The moment the lesion is passed the sensation of all

resistance disappears. It is essential to reach a level below the lesion, following which the stylet is withdrawn, the rubber tubing and anchoring cord remaining in place. The patient is then examined by means of the fluoroscope and the capsule is drawn upward to the level previously determined by the marks on the chest. Barium should not be administered during or following the introduction of the tube.

To date the authors have used 2 or 3 10-mgm tubes of radium with filtration of 1 mm of platinum. The sound is permitted to remain *in situ* from twenty-four to forty-eight hours, a dose of from 480 to 1,440 mgm being thereby obtained. A second application is made within several days, and if the condition of the patient is good, insertions are repeated at three-day intervals until from 4,000 to 5,000 mgm-hr are given. During the period that the radium is in place, 1 oz of olive oil (3 times daily), sodium bicarbonate, and sedatives are given. Liquids, such as milk, eggnog, and whiskey, are given also. Three cases in which the applicators were used are reported.

HAROLD C. OCHSNER, M.D.

(1) neoplastic formations in the bone presenting fuzzy contours with an irregular eroded interrupted or destroyed cortical layer (2) osteolytic zones in the spongy layer of the bone (3) intense decalcification (4) osseous tumor formations appearing in the form of bone spicules lying perpendicularly to the surface of the bone (5) invasion of the surrounding soft parts (6) rapid growth and invasion and (7) simultaneous participation of the entire circumference of the bone

In benign tumors on the other hand the bony contours are well delimited the cortical layer being relatively thin but not interrupted. The osseous structure is not much altered decalcification as a rule is not extensive the soft parts are not involved and growth is slow. Unfortunately all these differential points are not sufficient to formulate a diagnosis

It is often difficult to interpret the presence of areas of decreased density in the bone because it may be due to a multiplicity of processes such as decalcification destruction of the bone and replacement by a less dense osteoid tissue decalcification due to extensive vascularization and finally destruction of bone due to the invasion of neoplastic cells

It is therefore essential that the bone should be studied very carefully with reference to its internal structure as well as to its contour and surrounding soft structures

In many cases the lesion is so advanced that treatment would be of no avail in other cases the x ray film reveals suspicious lesions. In the latter instance the history physical findings and clinical examination may lead to the correct diagnosis

RICHARD E. SOMMA, M.D.

Jacobson L. E. and Rosenbaum D. Post Mortem Findings and Radio Activity Determinations Five Years After the Injection of Thorotrast. *Radiology* 1938 31 603

A white female patient aged seventy three and with complaints of weakness vertigo palpitation and dyspnea was admitted to the hospital in May 1937. The liver was barely palpable and the spleen was moderately enlarged. The liver function tests were normal. In 1932 it was believed that she had atrophic cirrhosis with splenomegaly. Hepatolienography after the injection of 75 c.m. of thorotrast at that time showed a slight enlargement of the spleen. The patient died in May 1937 and at necropsy significant changes were found in the liver spleen lymph nodes mediastinum and femoral arteries

The liver weighed 1150 gm. was firm in consistency and showed a few irregular surface depressions. On section a retracted yellowish streaked fibrous network was found throughout. The lobules were grayish and indistinctly delineated. Hematoxylin and eosin preparations of the liver showed large masses of a thorium compound in the form of grayish green granules. These were found largely in the portal spaces where some seemed to be free

in the fibrous tissue which was slightly increased. Other masses of thorium compound were found in phagocytes in the portal spaces. Some of the sinusoids appeared to be obstructed by large masses of the material which lay in swollen Kupfer cells.

The spleen weighed 180 gm. was indurated and heavy but not firm. The pulp was red and stippled with milky yellowish deposits. Sections of the spleen showed large collections of a thorium compound massed in and about the splenic corpuscles which were atrophic near the fibrous trabeculae and near the sheathed arterioles. In these locations the granular substance lay in large phagocytic reticuloendothelial cells. Similar cells were scattered in the pulp. Fibrous tissue was moderately increased. A lymph node from the region of the gall bladder bed contained large masses of thorium which were shown in germinal centers and in the reticulum throughout the lymphoid tissue. Sections revealed marked fibrosis. Mediastinal lymph nodes contained no thorium and were not fibrotic. The bone marrow showed neither thorium deposits nor fibrosis.

Measurements of radio-activity were made and showed that there remained in the liver five years after the injection of 75 c.m. of thorotrast approximately 27 per cent of the original gamma ray activity of the thorotrast. By means of Taft's results it was found that the liver would still contain a gamma ray equivalent of 0.37 microgram of radium. Taft had previously found 51 per cent of the original dose of radio active material in the ash of a liver a little more than a month after the injection of thorotrast.

The authors believe that the changes described were due to the long standing presence of thorium or its disintegration products and that the amount of radio active substance present was sufficient to induce the fibrotic changes seen in the liver spleen and lymph nodes.

HAROLD C. OCHSNER, M.D.

RADIUM

Rubenfeld S. and Schneider T. A New Device for Radium Application in Esophageal Malignancy. *Radiology* 1938 31 554

The authors believe that esophageal carcinoma which is a moderately sensitive tumor and remains localized in an approachable site should offer more chance of successful treatment than it has. They briefly review the literature on methods of radium application.

A new applicator is described which consists of four parts: (1) capsule (2) soft rubber tubing (3) an boring cord (4) stylet and handle. The capsule is made of hard rubber measures 8.4 cm. over all it has a hollow body 6.2 cm. long a hollow neck which is corrugated on the outside and a screw tip. The capsule gradually tapers from an outside diameter of 7 mm. at its widest point to 3 mm. at the end of the blunt rounded tip. The diameter of the hollow space is 3 mm. and the wall thickness is 1 mm. at the thickest point. In the proximal pole of the capsule is a small

and became softened and necrotic. The resulting ulcer was superficial and, upon early treatment with locally applied antiseptics, healed quite rapidly. If ulcers of this type are not interfered with, the streptococcus may invade deeply and produce an undermining of the tissues, with slowly progressive extension of the ulcer.

In both cases the ulcers had enlarged, they were irregular, firm, thick, and red, with a ragged, undermining border, an uneven deepening of a roughly granular glazed base, and were discharging a serous fluid. There were no complications other than a slight and transient regional lymphangitis. Biopsy studies revealed the presence of intracellular and extracellular cocci in pairs and short chains. Various types of media were inoculated with exudate from the ulcers and a pure culture of streptococcus was obtained.

In the first case, it was impossible to effect healing by means of locally applied antiseptics, although this type of treatment was tried for a period of nearly three months. Failure to heal was unquestionably due to the fact that the organisms, enclosed in a chronic, fixed tissue infiltrate in the region of the undermined portion of the ulcers, were beyond the reach of the various agents applied. The effect of sulfanilamide on the ulcers was sharp and prompt, which solved the problem of therapy.

In the second case, each of the leg ulcers was about four times the size of those in the first case. The bacteriological and histological findings were identical with those in the first case. The effect of sulfanilamide on these ulcers was likewise prompt.

Charts showing the dosage of sulfanilamide given, with notes as to its effect on the ulcers, are presented. A definite change was noted in the appearance of the ulcers after from two to three days of sulfanilamide therapy.

HARVEY S. ALLEN, M.D.

Kracke, R. R. The Relation of Drug Therapy to Neutropenic States. *J Am M Ass*, 1938, 111: 1255

Approximately 80 per cent of drug-produced agranulocytosis is caused by the administration of aminopyrine or one of its compounds, a lesser percentage is caused by the administration of dinitrophenol, arsephenamine, sulfanilamide, and novaldin.

The incidence of the disease is decreasing in the United States, probably because of the more cautious use of aminopyrine by the medical profession. The disease has practically disappeared from Denmark, because aminopyrine is no longer used in that country.

The number of cases of agranulocytosis from the use of sulfanilamide will probably increase in the future, particularly if this drug is incorporated in patented remedies and indiscriminately sold to the public under non-informing names.

Physicians should attempt to prevent this disease by caution in the use of these drugs, by instruction of patients concerning their purchase in drug stores, and by programs of public instruction.

SAMUEL KAHN, M.D.

Lyons, C., and Mangiaracine, A. The Effect of Sulfanilamide upon Human, Virulent Hemolytic Streptococci. *Ann Surg*, 1938, 108: 813

Lyons reviews the literature briefly and interprets the data so far published to indicate that the probable mechanism of sulfanilamide action on hemolytic streptococci is to alter the capsule of the organism in such a way as to render it susceptible to phagocytosis. In this way it is inferred that the effect of sulfanilamide is essentially similar and supplementary to that of specific antibacterial antibody.

Experiments are reported which are designed to show that serial subcultivation of virulent hemolytic streptococci in sulfanilamide containing media results in loss of some of the characteristics of virulence, namely, resistance to phagocytosis, resistance to spontaneous agglutination, and resistance to the bactericidal action of whole human blood. It is noted that the addition of "antibacterial antibody" to whole human blood containing sulfanilamide increases the streptococidal capacity.

On the basis of his clinical experience, Lyons believes that sulfanilamide will be effective in invasive human streptococcal infections only when the patient possesses (either through spontaneous development or immunotransfusion) specific antibacterial antibody. [His technique for selecting donors for immunotransfusions was described in the *J Am M Ass*, 1935, 105: 1972.] He recognizes, however, that there is variation in the susceptibility to sulfanilamide among strains of hemolytic streptococci and that some strains may be so altered by exposure to sulfanilamide as to be killed by human blood even in the absence of specific antibody. Effective treatment for patients with sustained bacteremia and no antibody should consist of sulfanilamide medication and the intravenous administration of specific antibacterial antibody by the immunotransfusion technique.

JOHN S. LOCKWOOD, M.D.

DUCTLESS GLANDS

Thorn, G. W., Emerson, K., Jr., and Eisenberg, H. Oral Therapy in Adrenal Insufficiency. *Endocrinology*, 1938, 23: 403

Attention is called to a report by Osler in 1896 of the successful use of a glycerol extract of fresh adrenal tissue in the treatment of Addison's disease. The authors have investigated the effect of the oral administration of a concentrated extract of adrenal cortex preserved in glycerol (1 c cm representing 50 gm of fresh adrenal cortex) in patients with Addison's disease and in bilaterally adrenalectomized dogs. A decrease in the renal excretion of sodium and chloride and an increased potassium excretion resulted. "Glycerol-extract treatment prevented the usual sodium and chloride diuresis which follows bilateral adrenalectomy in the dog. Bilaterally adrenalectomized dogs were maintained successfully on the glycerol preparation for prolonged periods. In man and dog the ratio of the amount of extract administered twice daily by mouth as compared to

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Opsahl R. The Pathogenesis of Arterial Hypertension with Special Regard to the Role of the Kidneys and Adrenal Glands in the Production of White High Blood Pressure (Zur Pathogenese der arteriellen Hypertension unter besonderer Berücksichtigung der Rolle der Nieren und Nebennieren im Mechanismus des weissen Hochdrucks) *Acta Med Scand* 1935 Supp 92

This monograph on the pathogenesis of high blood pressure is among the longer treatises of foreign origin to appear in 1938. While Opsahl hesitates to minimize the importance of animal experimentation in the study of the cause of hypertension, he makes it clear that he believes with many other clinicians of his acquaintance that the solution of the problem is to come about through a detailed study of large series of clinical cases. His paper is essentially a summary of first the current ideas relative to the nature of hypertension and second of his own clinical observations.

His interest is directed principally toward the function of the adrenal glands. He believes that there are three distinct forms of arterial hypertension: the purely constitutional type with the clinical picture of Volhard's red hypertension; a purely renal form; and a combined constitutional renal form, the latter two types falling under the old classification of Volhard's white hypertension comparable in part to the modern conception of essential hypertension. These two forms with the renal component are to be explained by the fact that when the filtration mechanism of the kidneys is impaired, be it either because of intrinsic disease of the kidneys (glomerulonephritis, nephrosclerosis, renal arteriosclerosis) or because of failure of the rest of the cardiovascular mechanism, a higher head of pressure in the glomeruli is needed to provide a filtration efficiency compatible with life. This increased pressure is brought about by a hyperactivity of the adrenal glands with a resultant general increase in vascular tone and cardiac efficiency. The author finds support for this belief in Cannon's original conception of the emergency function of the adrenal gland.

Opsahl has avoided any suggestions as to the rational treatment of hypertension. The references to the literature are numerous and well selected.

JOHN MARTIN M.D.

Heymans C. Some Aspects of Regulation of the Blood Pressure and Experimental Arterial Hypertension *Sirgey* 918 4 48

This short report is a concise statement of Heymans' experimental approach to the subject of hypertension of his pertinent physiological findings

and briefly of his conclusions together with those of his several collaborators. Heymans has for many years studied the physiology of the carotid sinus and the cardio-aortic nerves which he terms the buffer or moderator nerves of the blood pressure. He has repeatedly shown that section or depression of the nerves causes a marked increase in the blood pressure as a result of the release of the vasoconstrictor and cardio-accelerator centers, the activity of which under normal conditions is permanently moderated reflexly by the aortic and carotid sinus nerves. He believes that the moderator activity of these nerves is controlled by means of the pressure and the chemical constitution of the blood, since the two factors act on the pressure-sensitive and chemosensitive nerve endings of the cardio-aortic and carotid sinus vascular areas. The severity of a hypertension resulting after destruction of these nerves seems to depend principally upon the sympathetic vaso-pressure or tone and Heymans finds that complete removal of the sympathetic chain and ganglia from the stellate to the pelvic ganglion in the dog prevents or cures this type of experimental hypertension.

Heymans does not know just where in relation to the hypertension of human subjects to place the hypertension produced by destruction of the sinus moderator nerve. To him it resembles essential neurogenic hypertension rather than the nephropathic variety. He did note, however, that the carotid sinus vasopressor and hypertensive reflexes were especially active in the Goldblatt type of dog.

JOHN MARTIN M.D.

Goodman M.H. Chronic Streptococcal Ulcer of the Skin *J Am M Ass* 1935 11 1477

Reports of chronic ulceration of the skin in which the streptococcus plays a primary etiological role cannot be found in the literature. In streptococcal pustular dermatitis the organism is present only in the purulent exudate and ceases to be active when free drainage is accomplished and cleanliness is maintained by the local application of antiseptics. The type of ulcer which forms the basis of this report is unique in that it was produced by streptococci presented features of chronicity both clinically and histologically and occurred on the skin of healthy individuals.

The author presents the complete history in two cases with a report of his bacteriological and histological studies. In the first case ulcer appeared on the forearm and leg of the patient; in the second case the ulcers appeared on both legs.

In both cases there were found a variety of beta hemolytic streptococci capable of producing a low grade of necrosis leading to chronic ulceration. The organism proved to be a streptococcus pyogenes of human strain which when accidentally transferred to the skin produced an area of redness and edema.

INTERNATIONAL ABSTRACT OF SURGERY

MAY, 1939

SURGERY AND THE BASIC SCIENCES

THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

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VITAMIN E

THE increasing use of wheat-germ oil in the treatment of habitual and threatening abortion makes a review of the present state of our knowledge of Vitamin E particularly appropriate. In 1921 Evans and Bishop (36) discovered that rats subsisting on a diet containing adequate amounts of the then known vitamins grew normally and exhibited normal estrus cycles, yet were unable to carry through a normal gestation because of death and resorption of the fetuses. The addition of extra amounts of Vitamins A, B, and D failed to correct the condition, although the addition of natural food proved to be curative. In the following two years similar results were reported by Mattill (37) and Sure (38). Accordingly a new fat soluble vitamin, Vitamin E, was proposed. Subsequent work has established the existence of this vitamin beyond question.

Vitamin E is widely distributed in natural foods. Most animal tissues contain limited amounts. Green leafy vegetables, such as lettuce, spinach, and water cress, contain liberal amounts. Cereals and seeds are rich sources, the vitamin being present almost exclusively in the embryo. Most vegetable oils contain Vitamin E and wheat-germ oil is the richest known source.

Attempts to isolate Vitamin E and to identify its chemical constitution have been in progress since its discovery. In 1936 Evans, Emerson, and

Emerson (39) succeeded in isolating three crystalline derivatives from the non-saponifiable portion of wheat germ oil. The active portion of one of these derivatives, called alpha-tocopherol, proved to be so potent that a single injection of 3 mgm served to carry a rat on a Vitamin E deficient diet through a normal gestation. Of the other compounds, one was found to be slightly active and the other inactive. Emerson, Emerson, Mohammad, and Evans (40) were able to isolate alpha-tocopherol from a number of other natural sources. In 1938 Karrer, Fritzsche, Ringier, and Salomon (41) announced the successful synthesis of alpha-tocopherol. This synthetic product was shown by Karrer and Demole (42) to be as potent biologically as natural alpha-tocopherol and to be free of toxic manifestations when administered in massive doses to a variety of experimental animals. As a result of the work of Fernholz (43), Bergel, Todd, and Work (44), John, Dietzel, Gunther, and Emte (45), Smith, Ungnade, and Prichard (46), Evans, Emerson, and Emerson (47) and Barne (48), the chemical structure, synthesis, and complete biological activity of synthetic alpha-tocopherol have been established and confirmed. Now that the synthetic vitamin has become available one may anticipate clarification of the remaining unsolved problems regarding the functions of this vitamin.

Vitamin-E deficiency produces characteristic types of sterility in male and female rats, mice, and chickens. In the female rat the estrus cycle,

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extract administered twice daily by injection : approximately 2.5 ml. No toxic effects were observed from the administration of 10 to 20 cc. of glycerol per day. Extract, administered orally, should not be used in the treatment of acute Addisonian crisis.

WALTER H. NADLER, M.D.

HOSPITALS, MEDICAL EDUCATION AND HISTORY

Hart D. Pathogenic Bacteria in the Air of Operating Rooms. Their Widespread Distribution and the Methods of Control. *Arch Surg* 1938 37:521

In 1937 Hart published a report on the use of bactericidal radiant energy in operating rooms as a means of preventing infections by air borne organisms (*Arch Surg* 1937 34:874). The validity of his conclusion that most operative infections were due to air borne contaminants was challenged in certain quarters. Thereupon the author obtained the co-operation of 33 hospitals in 17 states for the study of bacterial flora in the air of operating rooms. This article is a report of the study and includes a tabulation of the data sent in by the various hospitals together with the author's comment.

The average counts of bacteria were lowest in operating rooms which were equipped with air conditioning systems but even these averaged 35 colonies per hour of exposure of an agar plate. Hart claims that with the addition of bactericidal irradiation the number of colonies per plate per hour can be reduced to one or less. The numbers of bacteria in the air increase in proportion to the number of oc-

cupants particularly when one or more of the occupants has a respiratory infection. The majority of the pathogenic organisms recovered were staphylococci, streptococci being found only occasionally.

The author concludes (1) that pathogenic bacteria floating in the air and universally present in the occupied room are the greatest cause of infection in clean incisions in the modern well run operating room (2) that air conditioning with forced ventilation will reduce the degree of contamination of the air but will leave large numbers of circulating bacteria in the vicinity of the wound and the sterile supplies most of them derived from the operating personnel (3) that bactericidal irradiation of the air in the operating room is the only method available of achieving further reduction of air borne infection.

JOHN LOCKWOOD, M.D.

Nisbet O. M. and Brooke J. W. The Incidence of Air Borne Bacteria in the Major Surgery of the Multnomah County Hospital (Oregon). *Surgery* 1938 4:755

The number of air borne bacteria in the major surgery of Multnomah County Hospital is roughly proportional to the number of people in the surgery and to the activity on the floor proper of the surgery. The greatest proportional rise in incidence is manifested by the streptococci and the staphylococcus albus. The organisms showing this rise are acknowledged to be common inhabitants of the nasopharynx.

The estimated number of bacteria falling per hour on a sterile operating field compares unfavorably with similar figures obtained in other hospitals.

STANLEY KATZ, M.D.

and Mosely (71), who also reported that the condition could not be cured with Vitamin E. Evans, Emerson, and Telford (72) showed that the paralysis in the adult animals is also the result of a severe muscular dystrophy. This finding was confirmed by Knowlton and Hines (73). Marchesi (74) reported that the paralysis could be cured by including liver in the diet of the animals. This report, if confirmed, would indicate that two factors are concerned in the production of muscular dystrophy and paralysis in rats.

Muscular dystrophy has also been produced in rabbits and guinea pigs by Goetsch and Pappenheimer (75) by restriction of the Vitamin-E intake. Wheat-germ oil failed to cure the condition. According to Pappenheimer and Goetsch (76), muscular dystrophy can be produced in ducklings by the same methods. These results have been confirmed in the case of the guinea pig by Wood and Hines (77). Morgulis and Spencer (78) have attempted to identify the nutritional factors involved in the production of this muscular dystrophy in rabbits. They have found that, although *wheat-germ oil is not curative, whole-wheat germ is*. Their results suggested that a water-soluble as well as a fat-soluble factor is concerned. Further analysis of the problem by Morgulis, Wilder, and Epstein (79) has revealed that neither a fat-soluble fraction nor a water-soluble fraction of wheat germ is effective when given alone for the cure of muscular dystrophy. These two factors when administered together were found to be promptly curative. The chemical behavior and natural distribution of the fat-soluble factor were found to be similar to those of Vitamin E. The water-soluble fraction, which was found to be present in several foods and in yeast, appeared to be some component of the vitamin-B complex. Thiamin and riboflavin were easily excluded as possibilities, Vitamin B₆ appeared to be an unlikely possibility. These authors suggested that Vitamin B₁ might be the water-soluble factor required for the prevention of muscular dystrophy.

Still another curious deficiency disease has been produced by restriction of Vitamin E in the diet. Pappenheimer and Goetsch (80) produced a *nutritional encephalomalacia* in growing chicks. Such animals exhibited ataxia, tremor, twisting of the neck, clonic spasms, and, finally, stupor and death. According to Wolf and Pappenheimer (81) lesions occurred most frequently in the cerebellum, but often in the cerebrum and occasionally in the brain stem and medulla. Edema, degeneration of nerve cells and fibers, small hemorrhages, and capillary thrombi were noted in the affected areas. The degenerative changes appeared to be the

result of ischemia. This encephalomalacia was later found by Goetsch and Pappenheimer (82) to respond to the administration of vegetable oils or their non-saponifiable fractions. This discovery was confirmed by Babcock and Jukes (83). In the meantime, Keenan, Kline, Elvehjem, Hart, and Halpin (84) had produced a paralysis, which they considered to be identical with nutritional encephalomalacia by the administration of a simplified diet to growing chicks. The disease was preventable, however, by a water-soluble factor present in liver and grasses. Kline, Bird, Elvehjem, and Hart (85) found that this water-soluble factor was present in peanuts, whole-wheat germ, and in brain tissue. The factor was believed to be identical with Vitamin B₄, originally described by Reader (86) as a factor necessary for normal growth in the rat. However, the status of this vitamin at the present time is so uncertain that it is probably wisest to abandon the term. Nevertheless, the implication that two factors might be involved in the production of nutritional encephalomalacia has received support from Jukes and Babcock (87). These investigators have found alfalfa to be a rich source of a water-soluble factor which is potent in protecting chicks against encephalomalacia. Thus Jukes and Babcock had found that either a water-soluble or a fat-soluble factor could prevent the disease. That the fat-soluble factor is Vitamin E has recently been claimed by Dam, Glavind, Bernth, and Hagens (88), who were successful in preventing nutritional encephalomalacia in chicks by the administration of synthetic alpha-tocopherol.

Sterility as a result of Vitamin-E deficiency has been observed only in rats, mice, and chickens. The question, of course, arises as to whether other species, including man, also require the vitamin for normal fertility. Numerous reports have appeared which claim successful prevention of abortion in various farm animals by the administration of wheat-germ oil, but such experiments by no means clearly establish the necessity of Vitamin E for the normal fertility in these animals. The only method by which it can conclusively be demonstrated that this vitamin is necessary, is to show that a deficiency of the vitamin in the body results in a certain effect which can be corrected by restoring normal quantities of the vitamin. Such experiments have not been carried out in farm animals, nor in man. However, Vogt-Moller (89), Jukasz-Shaffer (90), Watson and Tew (91), and Currie (92) have administered wheat-germ oil to pregnant women in attempts to prevent abortion. As reported by the above workers, 80 per cent of 181 women who had had at least two previous

ovulation and fertilization proceed normally in the absence of vitamin E in fact no abnormalities have been observed in the maternal organism. Pathological development of the embryo and of the embryonic contributions to the placenta which *prevent successful implantation* are observable on the eighth day in rats. Normal implantation and gestation may ensue however if an adequate dose of vitamin E is administered as late as a few hours before implantation is to occur (Evans and Burr 49). Urner (50) has also reported normal development of the embryo up to the tenth day. At this time hemorrhage into the amniotic cavity rarefaction of the mesenchyme and failure of development of the blood vascular system produces necrosis and death of the fetuses which are then resorbed. The maternal decidua appear to be normal throughout which indicates that the failure of implantation and death of the fetuses cannot be attributed to abnormalities in the uterus or the maternal organism. Similar conclusions have been drawn from a study of the effects of vitamin E deficiency in chickens. Chickens receiving an inadequate amount of vitamin E continue to lay eggs but the latter do not hatch. Adamstone (51) has shown that death of the embryo usually occurs on the fourth day as a result of hemorrhages and a failure of vascularization due to the development of a so called lethal ring of proliferative tissue in the blastoderm. Barnum (52) has demonstrated a close correlation between the vitamin E content of the hen's diet and the vitamin E content of the eggs laid and the hatchability of the eggs so that there can be no question of the necessity of this vitamin for reproduction in the chicken.

Although a deficiency of vitamin E does not effect the reproductive system of the female animal *testicular degeneration* is a prominent effect of deficiency of this vitamin in male animals. The resulting sterility in male rats is irreversible in contrast to the sterility in female animals. Clumping and immotility of the sperm are first observed. Later degeneration of the germ elements of the testis appears (Evans and Burr 49). Adamstone and Card (53) have made similar observations in male chickens. Mason (54) has shown that the sterility which results from a deficiency of vitamin E can readily be distinguished from that which results from a deficiency of vitamin A.

Since extensive degeneration of the testes amounts to a *functional castration* changes might be expected to occur in the pituitary glands. Van Wageningen (55), Nelson (56) and Stein (57) have reported changes in the pituitary glands similar to

those observed after castration. Such changes do not occur in the pituitary glands of female animals subjected to a diet deficient in vitamin E because no degeneration of the ovarian tissue takes place. Rowlands and Singer (58) however have reported that the pituitary glands of female rats contain subnormal amounts of the luteinizing gonadotropic hormone. The significance of such a finding is questionable in as much as the ovarian function in such animals is normal. The same investigators as well as Singer (59) and Barrie (60) claim that hypoplasia of the thyroid glands also occurs in vitamin E deficiency. Telford, Emerson and Evans (61) have not been able to confirm this. The fact that vitamin E is concerned with the reproductive process has brought the inevitable attempts to explain its action on the basis of possible effects on the endocrine glands. Neither direct evidence nor theoretical considerations provides acceptable support for such speculations.

Evidence has accumulated which confirms the early belief of Evans and Burr (49) that a deficiency of vitamin E is also manifested as a *retardation of growth* in the rat. This defect does not become apparent early in life so that it has been overlooked by some workers. Blumberg (62), Martin (63), Alcott and Mattill (64) and Emerson and Evans (65) have demonstrated a late retardation of growth in rats deficient in vitamin E which can be cured or prevented by the administration of wheat germ oil. In view of the fact that wheat germ oil contains more than one biologically active substance the recent report of Evans, Emerson and Emerson (66) is of particular significance. They have shown that the administration of highly purified alpha tocopherol is capable of causing the resumption of growth in vitamin E-deficient rats.

In addition to failure of growth and reproduction other less clearly understood symptoms have been attributed to a deficiency of vitamin E. In 1928 Evans and Burr (67) reported that suckling rats born of mothers which had received just enough vitamin E to permit a successful gestation developed a characteristic paralysis. The condition could be prevented by the feeding of vitamin E to the mother during pregnancy but it could not be cured by the feeding of the vitamin to the paralyzed young. Lipshutz (68) attributed this paralysis to lesions in the vestibular apparatus but Alcott (69) has recently discovered severe degenerative changes in striated muscular tissue without detectable neural lesions. Ringsted (70) noted a similar paralysis in adult rats maintained for long periods on diets deficient in vitamin E. This was subsequently confirmed by Burr, Brown

which originates in the hypothalamus. There is some evidence which indicates that the autonomic effects which may be elicited by electrical stimulation of the cerebral cortex are mediated by tracts which arise in the cortex and course through or make connections with the nuclei of the hypothalamus.

Efferent paths from the hypothalamus extend to the thalamus with probable relays to the cortex. Other paths extend to the brain stem and spinal cord and to the hypophysis. It is by means of these connections that the hypothalamus exerts its possible influence on the cortex, regulates the secretory activity of the posterior division of the hypophysis, and accomplishes its regulation of visceral functions.

Hypothalamic control of autonomic functions
Karplus and Kreidl (3) in a series of articles published from 1909 to 1928 demonstrated that electrical stimulation of the hypothalamus in cats, dogs, and monkeys results in intense activity of the sympathetic nervous system. Pupillary dilatation, widening of the angle of the lids, retraction of the nictitating membrane, secretion of sweat, rise in the blood pressure, and inhibition of gastro-intestinal movements were observed. More recently Kabat and his coworkers (4) have carefully localized the various reactive areas in the hypothalamus of the cat. Systematic exploration of this portion of the brain with stimulating electrodes was made possible by the use of the Horsley Clark stereotaxic instrument. This instrument consists of a frame adjustable to the animal's head, which enables an electrode to be accurately oriented at any desired point within the brain. By means of this technique every cubic millimeter of the hypothalamus and adjacent regions was systematically explored and stimulated. The areas which yielded autonomic effects on stimulation, including rise in the blood pressure, dilatation of the pupil, contraction of the urinary bladder, and, in addition, inhibition of the respiratory rate were accurately mapped. The purely sympathetic reactions were elicited from areas limited to the hypothalamus. Contraction of the urinary bladder was traced to its point of origin in the pre-optic areas, and respiratory inhibition, as well as fall in the blood pressure, were traced into the cerebral cortex. Kabat, Anson, Magoun, and Ranson (5) also stimulated the hypothalamus in cats after recovery from the anesthetic had taken place. Intense emotional excitement, which simulated rage, was revealed by rapid respiration, erection of hair, dilatation of the pupils, protrusion of the claws, spitting, struggling, and biting. Numerous other workers have obtained generalized sympa-

thetic discharges by stimulation of the hypothalamus in a variety of animal species.

Although most workers agree that the hypothalamus functions as a center for the "sympathetic" nervous system, there is considerable disagreement in regard to the existence of a "parasympathetic" center in the hypothalamus. Beattie and Sheehan (6) claim that stimulation of the posterior part of the hypothalamus produces a sympathetic discharge, whereas stimulation of the anterior portion produces a generalized parasympathetic discharge, as evidenced by a fall in the blood pressure, rise in the intragastric pressure, and constriction of the pupils. Although many have accepted the view that a parasympathetic center is present in the hypothalamus, others interpret the facts differently. Ranson and Magoun (1) point out that the evidence which they have obtained indicates that the parasympathetic effects elicited by hypothalamic stimulation are the result of stimulation of fiber tracts descending from more rostrally located areas including the pre-optic region and the cerebral cortex.

In 1932 Cushing (7) attributed to injury of the hypothalamus the severe gastric disturbances which sometimes occur soon after surgical manipulation at the base of the brain. The fact that hypothalamic irritation may produce motor disturbances in the stomach lends a degree of credence to this explanation. Hoff and Sheehan (8) reported that surgical lesions in the hypothalamus in monkeys may produce acute multiple hemorrhagic erosions in the gastric mucosa. Keller and D'Amour (9) have reported the occurrence of gastric lesions in dogs following soon after injury to the hypothalamus. Although this work may explain the occurrence of acute gastric lesions which occasionally follow surgical intervention in the hypothalamic region, it should be pointed out that these findings have no significance for the etiology of chronic peptic ulcer. By means of the Horsley-Clark instrument Martin and Schnedorf (10) made discrete lesions in various portions of the hypothalamus in 7 monkeys and 40 cats. These animals, which survived the procedure without acute symptoms, were observed carefully for a prolonged period. No evidences of gastric disturbances were found in these animals.

Heat regulation
The mechanism of heat loss and heat conservation by the body require the co-operation of many visceral functions, such as vasomotor changes, alterations of the water balance, sweating, and secretion of adrenalin, so that it is not surprising to find that the hypothalamus is intimately concerned in the process of heat regulation. In 1912 and 1914 Isenschmid and

spontaneous abortions were enabled to bear living children after treatment with wheat germ oil. In addition 80 per cent of 34 cases of threatened abortion treated with wheat germ oil went to term. As would be anticipated not a single case of primary or secondary sterility which has been successfully treated with wheat germ oil has been reported. Shute (93) has reported very satisfactory results with wheat germ oil in 82 cases of mild and severe abruptio placentae. He claims that many cases of abruptio placentae are overlooked for the early diagnosis of this condition. He stresses the importance of localized uterine tenderness and sacral backache. Perhaps some of his success with wheat germ oil should be attributed to his criteria for the early diagnosis of abruptio placentae.

The published reports might easily convince the uncritical reader that wheat germ oil is extremely effective in the prevention of abortion. Actually the data submitted permit no conclusion whatsoever. There are innumerable reports which reveal the incidence of successful gestation in previously aborting women who have been treated with innumerable remedies. Yet one can scarcely find anywhere in the literature reliable information on the incidence of successful gestation in previously aborting women who have received no treatment. Available in the records of any large hospital is the information which is absolutely indispensable for the interpretation of the otherwise meaningless results obtained by treating thousands of patients. Information of the required type has recently been made available by Malpas (94). His study of 6,000 pregnancies revealed an incidence of spontaneous abortion of 18

per cent. Obviously with such a high incidence multiple abortion might occur in a single individual on the basis of random chance alone. Accordingly Malpas undertook to define habitual abortion. According to his statistical analysis if a woman has had 3 successive abortions the chances are overwhelming that some recurrent cause and not merely chance is responsible for the abortions. On the basis of this definition habitual abortion occurred in only 1 per cent of the 6,000 pregnancies; the remaining abortions being attributable to casual factors. Malpas has further calculated the spontaneous cure rate for women who have had various numbers of successive abortions. For women who have had 1, 2, 3, and 4 previous successive abortions the spontaneous cure rates are respectively 73, 6, 27, and 6 per cent. This means for example that of 100 women who have had 2 previous successive abortions 62 may be expected to carry through the third pregnancy successfully without any treatment at all. Malpas data show also that the cure rate may be somewhat higher than this with only general medical care. As mentioned above, women who had had 2 or more previous abortions and who were treated with wheat germ oil exhibited a cure rate of approximately 80 per cent. Whether this difference is significant and indicates a specific effect of treatment with wheat germ oil it is difficult to say. Malpas treated a series of 9 cases of habitual abortion and obtained results which were not notably different from the spontaneous cure rate. Accordingly the available data by no means proves conclusively that Vitamin E is valuable in the prevention of abortion in women.

THE HYPOTHALAMUS

Experimental investigation of the functions of the hypothalamus has been carried on only during the past thirty years. As a result of this work and parallel studies of the functions of the hypophysis much of the confusion surrounding the related functions of these closely adjacent structures has been dissipated. The importance of the hypothalamus for the regulation of vegetative functions is now well recognized. It has been shown that this relatively small portion of the brain is engaged in the regulation of body temperature, sleep, reproductive processes, emotional reactions and expression and of fat carbohydrate and water metabolism. These functions of the hypothalamus have been recently discussed in an excellent review by Ranson and Magoun (1).

Anatomy of the hypothalamus. The hypothalamus constitutes the floor of the third ventricle and

consists of both fiber tracts and nuclei. It should be distinguished from the subthalamus which lies above and lateral to the hypothalamus and subserves purely somatic functions. Just rostral to the hypothalamus lies a structurally related area the pre-optic region. According to the recent description of Clark (2) there are three main divisions of the hypothalamus: the pars supra-optica (anterior) so named because it lies over the optic chiasma; the pars tuberalis (middle) to which the stalk of the pituitary is attached; and the pars mammillaris (posterior) which includes the mammillary bodies.

Numerous fiber tracts reach the hypothalamus from the rhinencephalon and from the frontal lobe areas of the cerebral cortex. It is probably by way of the latter tracts that the cortex exerts an inhibitory influence on the emotional expression

bodies exhibited somnolence, decreased emotional reactions, tameness, and reduced motor activity. These reactions are to some extent the counterpart of "sham-rage." The fact that lesions located anterior and dorsal to this region failed to produce somnolence indicated that the latter is not the result of interruption of conduction pathways from the hypothalamus to the cortex. Rather, the influence of the hypothalamus is mediated by descending pathways to the lower centers in the subthalamus, brain stem, and spinal cord. This is in accord with the known fact that the cerebral cortex is not essential for the occurrence of alternate waking and sleeping periods. This interpretation confers on the hypothalamus the function of a "waking" center rather than that of a "sleep" center, as has previously been suggested. In agreement with this interpretation is the recent report by Serota (20) that sleep in cats is accompanied by a decrease in the metabolism of the hypothalamus. The theory that sleep is produced by the activity of a "sleep" center would demand that the metabolic activity of the hypothalamus increase during sleep. Serota employed temperature changes as an index to metabolic activity in his experiments.

Recently Grinker and Serota (21) have electrically stimulated the hypothalamus in human subjects. Special electrodes were devised which could be introduced through the nasal passages into the substance of the sphenoid bone adjacent to the hypothalamus. Stimulation by this technique produced marked pupillary dilatation, generalized hyperemia of the skin, copious perspiration, and a considerable rise in the blood pressure. Evidence of striking emotional reactions, such as anxiety, crying, and fear, were also observed. Simultaneous recordings of the electrical potentials from the cortex and hypothalamus revealed an increase in activity in these regions. Similar alterations in electrical potentials could be induced by ideational, emotion-laden stimuli delivered orally to the subjects.

The thalamus, hypothalamus, and emotions. The fact that exaggerated or depressed emotional reactions are associated experimentally with the hypothalamus suggests a possible relationship between the latter and psychic disturbances. Typical maniacal symptoms have been produced in surgical patients by manipulation of the hypothalamus during cranial operations. In cases of tumors affecting the region of the third ventricle, depressed states, catatonia, agitation, and confusion have been noted. Korsakoff's syndrome has been found to be associated with detectable degenerative changes in the hypothalamus (re-

viewed by Gagel (22). Morgan and Gregory (23) have reported degenerative changes in the tuber nuclei in 32 cases of psychoses with advanced mental deterioration. Alpers (24) has recently described the development of a psychosis in an individual, coincident with the development of a teratoma of the third ventricle.

These studies on the relationship of the hypothalamus to emotions have, of course, attracted the attention of psychologists. Much doubt has been expressed regarding the validity of the James-Lange theory of emotions which states that the subjective emotion is the result of somatic and visceral activity rather than the cause. For example, the theory maintains that one feels sorry because one is crying instead of the reverse. This doubt has stimulated the search for alternative theories. Head has elaborated a thalamic theory of emotion which states that the "center" for emotion is present in the thalamus. This "center" may be stimulated by ascending sensory impulses from the periphery or by descending impulses from the cortex; it discharges by way of the hypothalamus to produce overt expression of the emotional state. A critical analysis of this theory reveals that the only contention which is adequately supported by experimental evidence is that the motor centers for emotional expression are located in the hypothalamus.

Hypothalamic control of the metabolism. The hypothalamus in conjunction with the pituitary gland plays an important rôle in the regulation of the water balance. In the supra-optic nucleus a fiber tract arises which terminates in the posterior division of the hypophysis. Injury to the supra-optic nucleus, or to the supra-optico-hypophyseal tract, or extensive destruction of the posterior division of the hypophysis eliminates the secretion of the antidiuretic principle by the hypophysis and diabetes insipidus results. This subject has been discussed in detail in a previous review of this series (25).

The hypothalamus also plays a little understood rôle in the carbohydrate metabolism. Hyperglycemia following stimulation and hypoglycemia following destruction of the hypothalamus have been repeatedly observed. Davis, Cleveland, and Ingram (26) found that some cats with hypothalamic lesions failed to develop diabetes mellitus after removal of the pancreas. Houssay (27) made the same observation in toads, but was unable to repeat these results in dogs. Morgan, Vonderahe, and Malone (28) have detected degenerative changes in the hypothalamus in patients with diabetes mellitus and Frommelt (29) has reported 2 cases of hemorrhage

Krehl (11) and Isenschmid and Schnitzler (12) clearly demonstrated the importance of the hypothalamus in temperature regulation. Since this time numerous articles on this subject have appeared. There has been little agreement however in regard to localization within the hypothalamus and in regard to the existence of one or two heat centers in the hypothalamus. Magoun, Harrison, Brobeck, and Ranson (13) have recently introduced a refined method for localizing heat sensitive portions of the brain. By means of the Horsley Clark instrument they have placed electrodes in the brain of cats and applied high frequency currents to deliver definitely localized heat. A sharply circumscribed area in the pre-optic region and anterior portion of the hypothalamus gave typical responses to local heating characterized by polypneic panting and sweating on the pads of the feet. Crude heating methods employed by earlier workers had suggested that the corpus striatum or the thalamus might be the area responsive to local heating. Thus more recent work based on a more delicate and reliable technique definitely excludes these areas from consideration.

Clark, Magoun, and Ranson (14) have very recently studied the disturbances in temperature regulation which result from discrete lesions produced in the hypothalamus with the Horsley Clark instrument. Lesions in the pre-optic region and anterior portion of the hypothalamus rendered cats incapable of dissipating heat when exposed to high environmental temperatures. Their ability to maintain a normal temperature when subjected to a cold environment however was not impaired. Laterally placed lesions in the caudal part of the hypothalamus impaired the ability of the animals to maintain a normal body temperature when placed in either a warm or a cold environment. Similar results have been obtained in monkeys by Ranson, Fisher, and Ingram (15). These results are interpreted by the investigators as follows: A receptive mechanism specifically sensitive to heat lies in the pre-optic and supra-optic regions. When the temperature of this part of the brain becomes too high polypneic panting and sweating occur. The location of the efferent center or centers for this heat loss mechanism is not known except that the motor center for polypneic panting probably lies in the mesencephalon. Bilateral destruction of this heat sensitive area or of the path leading backward from it through the lateral hypothalamus causes a loss of ability to keep the body from overheating. Body temperature is prevented from falling too low by heat formation and conservation which are accom-

plished by vasoconstriction, fluffing of the hair, shivering and increased muscular tension. Destruction of the posterior lateral portion of the hypothalamus abolishes these mechanisms. The effectiveness of these lesions is due to interruption of the chief descending pathways from the hypothalamus. Keller (16) has also recently shown that severance of the descending fibers from the hypothalamus interferes with mechanism for heat production and conservation. This recent work serves to clarify the problem of the rôle of the hypothalamus in temperature regulation.

Ranson and Clark (17) have reported that the marked neurogenic hyperthermia which frequently follows intervention in the region of the hypothalamus in animals can be controlled by the administration of sub-anesthetic doses of nembutal. These observations of course are related to the mechanism by which various types of fever are produced, particularly the hypothermia and hyperthermia of encephalitis.

Cortico-hypothalamic relationships. Since the last century it has been known that removal of the cerebral cortex exaggerates the emotional reactions of animals. The decorticate cat or dog is able to walk, run, sit, crouch and right itself. It loses all learned behavior however and is unable to learn new behavior patterns. The slightest stimuli serve to throw such animals into fits of sham rage. Bard (18) has shown that the caudal portion of the hypothalamus is essential for the appearance of sham rage in decorticate animals. In addition to rage these animals exhibit two other types of emotional behavior: fear and sexual excitement. Sham rage is accompanied by erection of the hair, sweating, retraction of the nictitating membrane, exophthalmos, rise in the blood pressure and acceleration of the heart rate. These phenomena it will be remembered are also produced by stimulation of the hypothalamus. Sham rage is interpreted as a release of hypothalamic activity from cortical inhibition.

Not only does the cortex influence the activity of the hypothalamus but the latter also influences the activity of the cerebral cortex although it may be indirectly. Clinical observations have shown that tumors of the hypothalamic region are frequently accompanied by somnolence. Many theories have been proposed to account for the rôle of the hypothalamus or adjacent areas of the brain in the production of sleep. Very recently Ranson (19) has investigated the occurrence of somnolence in monkeys following localized lesions produced with the aid of the Horsley Clark instrument. Animals with bilateral lesions in the lateral hypothalamus extending through the mammillary

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into the hypothalamus accompanied by hyperglycemia and glycosuria without acidosis. These various observations do not readily lend themselves to interpretation. A systematic analysis of the rôle of the hypothalamus in carbohydrate metabolism is much needed.

In regard to fat metabolism the situation is still more obscure. It can only be said today as it could be said years ago that hypothalamic injury is sometimes accompanied by obesity. The peculiar hemiatrophy or progressive atrophy of subcutaneous fat (lipodystrophy) can only be explained on a nervous etiology.

The hypothalamus and reproduction. Bard (30) who worked with cats and Brooks (31) who worked with rabbits have observed normal sex behavior at estrus after removal of the cerebral cortex. In guinea pigs Dempsey and Rioch (32) have recently demonstrated that the region of the hypothalamus is indispensable for the appearance of sexual behavior patterns at estrus. Further evidence of the importance of the hypothalamus in reproductive functions has been obtained in rabbits. This species of animal does not ovulate spontaneously; ovulation occurs only after coitus or active sexual excitement and it depends on nervous factors. Both Harris (33) and Brooks (34) have reported that ovulation in rabbits is prevented by severance of the stalk of the pituitary gland. Presumably this effect is due to interruption of the hypothalamohypophyseal tract by means of which the hypothalamus during sexual excitement activates the anterior lobe of the pituitary gland to liberate gonadotropic hormones. Fisher, Magoun and Ranson (35) have also shown that labor is abnormally prolonged in cats with diabetes insipidus induced by interruption of the supra-opticohypophyseal tract. This suggests still another function of the hypothalamus in reproductive processes although the prolonged labor may be due to the disturbed metabolism of water and electrolytes associated with diabetes insipidus.

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Padgett suggested "placing circumferential wires entirely around the body of the mandible after which they may be run posterior to the alveolar ridge, through the palate and across the floor of the nostril and then downward beneath the upper lip." The penetration of sound tissue to place wires seemed of dubious value to Pickerill since it introduced an element of sepsis. The author, however, has been able to substantiate clinically reports on the use of circumferential wiring that terminated satisfactorily (Fig 1)

BONE SUTURE

Penetration of the bone for the passage of the binding medium constitutes the second means of direct maintenance of the fragments. The choice of ligature seems to have been metal wire, usually silver, although thread, kangaroo tendon, and catgut have had varying popularity. Regarding application of the ligature, Béranger-Féraud mentioned (a) a suture passing from the periosteum to the medulla of one fragment, and from the medulla to the periosteum of the opposing fragment, (b) an inflexible suture traversing the bone vertically in order to retain both fragments in an oblique fracture, and (c) a suture passing completely through each of two opposing fragments, maintaining them when the ends are twisted or lashed together (Fig 2).

An early use of suture was reported by Heard in 1839. He believed that Rodgers of the New York Hospital was the first to freshen fragment ends, drill holes in them, and maintain coaptation with silver wire. In 1847, Buck used silver wire for a badly compounded jaw fracture. A decade later, Kinlock obtained union with direct fixation after ligation of the upper and lower canine teeth on each side of the jaws had been ineffective. Cooper used silver ligature with drainage for a jaw fracture sustained twenty months earlier, and stated, "This leaving of wounds open after operations upon the bones I regard as a *sine qua non*, and never to be neglected." Other nineteenth century reports of favorable results from the use of bone suture were contributed by Hamilton, Howard, Bell, Thomas, Gant, and Dittel.

In the use of suture, both the surgical approach and the mode of application are important. Annandale used an external incision, although he preferred to avoid a cutaneous scar. Wetherill, Dieulafoy, and Mursick favored external access, while Blair and Marshall employed it for fractures posterior to the first and second molars, respectively. To insert the suture, McCurdy used a notched drill threaded with silk. Browne elevated the humble awl of the shoemaker to a surgical



Fig 1 A case of the author's in which a fracture through the angle in an edentulous mandible was treated by circumferential wiring, using the patient's denture

plane. Wheelhouse put silver pins through the bone which were laced together with silk thread. Stevens used silver-plated copper wire. Carter utilized an auxiliary wire to draw the suture through the "difficult" second hole. He also fashioned a key device to hold wire while it was being twisted. Thomas and Jones used a key to coil the wire ends after the suture was in position. Cole, Imbert and Real, and Johnson used plates. Gilmer, in the much-quoted case reported in 1887 which so firmly linked his name with intermaxillary wiring, placed platinum ligature through

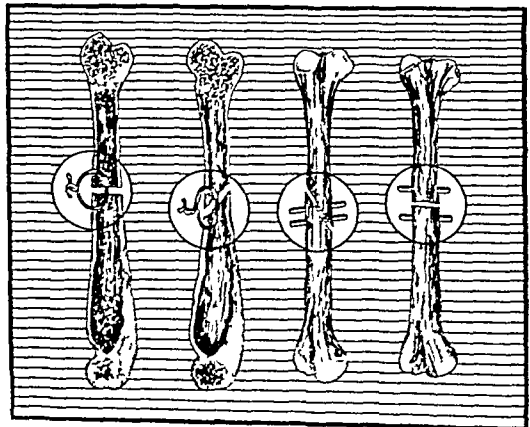


Fig 2 Types of direct bone suture as classified by Béranger-Féraud

BONE LIGATION AND SUTURE IN RELATION TO FUNCTIONAL DEFECTS AND TISSUE LOSSES IN THE MANDIBLE

Collective Review

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WHILE there have always been surgeons who applied a 'Micawberish' philosophy when handling fractures of the mandible their number has remained in the minority. From antiquity to the present some form of treatment has been the rule and the number of methods devised is ample attestation to the difficulties involved. Therapeutic measures may be classified as indirect—external splints and bandages and any means primarily employing the teeth and direct—the banding together of the separated fragments either by encircling them or by penetrating the bone. Probably every kind of ligation has been used including bone pegs nails and screws and plates.

CIRCUMFERENTIAL WIRING

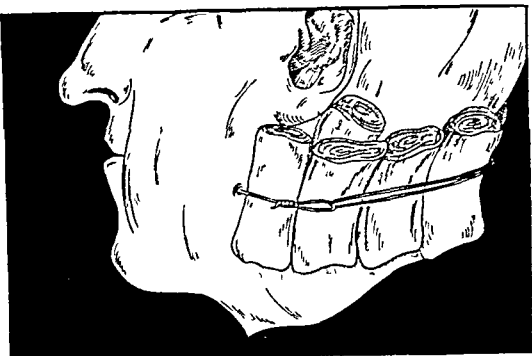
Berenger Feraud distinguished the term suture from ligation. The first he pointed out applied to the actual penetration of the osseous tissue to obtain fixation and the second to the encircling of the bone with a binding medium. After a study of available historical data he concluded that the early Arabian physicians had introduced bone ligation. As a youth in Algiers he had listened to surgical doctrines that had been handed down through the ages by native medical men. When fractures would not heal so their story went one cut off the ends with a sharp instrument and then bound the bones together with lead or iron wire as one would mend a broken cane. The same author found the earliest written reference to bone ligation in a journal published in 1775 in Toulouse a city undoubtedly influenced by the Moorish occupancy of near by Spain. Another Frenchman Baudens (1840) when reporting a case of jaw fracture remarked I used a suture needle to bind the fragments together strongly. In short I made a bone suture. However the first part of his statement indicates that he placed loops around the bone. This general idea has been utilized by Robert Wormald Tibbets and Willien

It remained for Black in America to devise a technique for wiring around the bone that was widely acclaimed and is still designated as

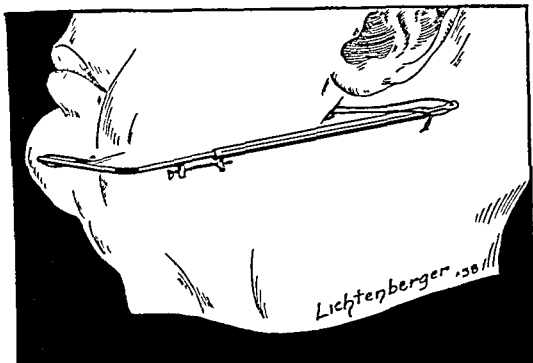
Black's circumferential wiring. In a paper read before the Illinois State Dental Society in 1881 Gilmer described Black's method and during the ensuing discussion its originator explained his first use of the technique for a severely compounded multiple fracture in the mandible. A corrected gutta percha model reinforced by an enclosed wire was prepared then a needle with stout thread was carried down close to the lingual side of the jaw and brought out on the surface. The needle was then reinserted in the same opening and followed an identical course upward to the bone and then was curved to come up closely along the labial side. This procedure was continued until two threads were brought up from under each fragment with ends hanging loose. Then beginning at one side the teeth in a fragment were forced gently into position in the splint and held by tying the threads. When all parts were correctly opposed and maintained wires were substituted and the threads withdrawn. In concluding Black observed that these measures were indicated only in extreme cases.

Circumferential wiring in selected types of fracture in edentulous jaws has been reported by Blair Waldron Cole and Bubb the Englishmen cite its use (1) when firm teeth are insufficient in number (2) when the tendency to displacement is great (3) when splints are used following operation for malocclusion and (4) when a mandibular splint could not be retained otherwise. With comparatively few exceptions however this method has been associated with the treatment of edentulous jaws. Gillies and McIndoe Blair Gilmer Dunning Bodine and Risdon being among those to favor its application. By Waldron Schaefer and Skinner have varied the technique by using a trocar and cannula. Goodsell in addition to fracture fixation used circumferential traction for delayed reduction. Strath mentioned circummandibular wiring

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A



B.

Fig 4 A, Darcissac's method for retaining the posterior fragment B, Posterior fragment maintained by extensible external splint Method of Dufourmental and Darcissac

near the point of fracture was exposed and a hole drilled from the inner surface of the bone. Heavy wire, steadied by washers, was maintained by elastic traction to a head band until displacement was corrected, then the nail extension device was fastened to the curved arm of an interdental splint. This procedure was modified further by Wassmund in 1927. During the same year, Lenormant and Darcissac reported a case of bilateral fracture in the region of the angles. They drilled the lower border of each posterior fragment for wire loops that were connected to a fold of cloth across the back of the neck by elastic bands (Fig 4A). In 1933, Dufourmental and Darcissac published a report of fracture in a very thin edentulous mandible that required cautious handling. Each fragment was drilled to receive a wire loop. A tube with forked ends was arranged to exert tension on these loops in opposite directions (Fig 4B). Another Frenchman, Crocquefer, employed a comparable method, but fastened the wire from the short fragment to a head band.

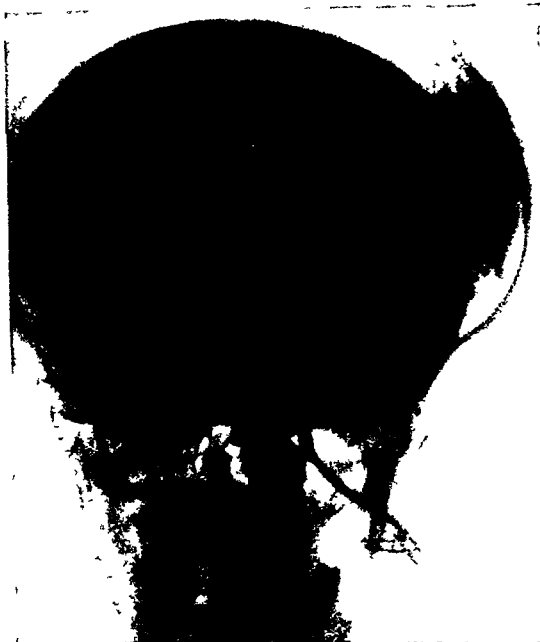
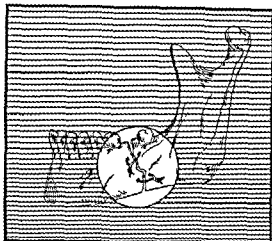


Fig 5 Fracture of the mandible treated by the author according to Ivy's modification posterior fragment is wired and attached to plaster head cap, anterior fragment is immobilized by interdental wiring. Small fragment in fracture line was exfoliated.

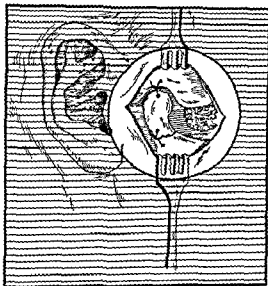
Ivy favored Darcissac's technique but preferred the use of a plaster-of-Paris head cap, a mode of treatment to be accorded approbation by Gillies, Risdon, Blair, New, Waldron, Padgett, Collins, and Straith. While the author has employed the "plaster head cap method" (Fig 5) with commendable success, he is inclined to agree with Northcroft, who considered that a completely satisfactory method of treating this type of fracture was yet to be advanced. If a form of intra-oral therapy were provided that assured firm fixation of the posterior fragment without traumatizing additional tissue or causing cosmetic defects, the problem would seem to be solved.

Malrelation of the Jaws

Pronounced deformities in the lower jaw, whether created by macrognathia or micrognathia, formerly required surgical interference, the more usual forms were horizontal cuts through the ram, or straight, step, or oblique incisions through the body of the mandible. Since complete immobilization of the jaws for an extended period is essential with any method, some surgeons considered that further fixation was unnecessary.



A.



B.

Fig. 3. A. Bone suture as applied to a fracture in the molar region. B. Application of bone suture in an open reduction of a grossly displaced condylar fragment as depicted by Wassmund.

the bone before wiring the teeth. In severe gun shot wounds Kazanyan's restorations through the ingenious use of suture are outstanding. In edentulous patients he provided for drainage by allowing one end of wire to penetrate the oral mucosa. Pickernill drilled holes beyond the alveoli of both jaws and laced them with silver wire.

Logan Fry, Schaefer and Skinner, Wassmund, Sonntag and Rosenthal and Schroeder preferred

double suture. Link and Martner and Lemerle looked with disfavor upon the use of suture while such surgeons as Albee and Seldin, Risdon Blair, Cole, Bubbs, Ivy, Dolamore, Sebileau, Whitelocke and Levison believed that direct ligatures were essential in some instances. Recently Blair, Brown and Byars have mentioned direct bone fixation as the only means other than the use of the teeth for obtaining absolutely accurate and stationary anchorage for mobile fragments. On the whole perhaps the position of bone suture today in relation to selected cases (Fig. 3) may be summed up in the words of Neff: "The use of wire in surgery of the bones has a limited field but that it has a very definite place in which no other method is practicable must be admitted by all surgeons."

SPECIAL APPLICATIONS

Suture of the bone has been used when as already noted existing circumstances have inhibited or rendered other therapeutic measures unwise. At the same time direct fixation has been utilized as an integral factor in the handling of certain conditions in the mandible with distinguishing characteristics which have segregated them: i.e. edentulous posterior fragments, maldevelopment and osseous tissue loss.

Edentulous Posterior Fragments

A fracture behind the last molar tooth creates the problem of the edentulous posterior fragment. For treating this condition many surgeons have found it expedient to rely solely upon the surrounding musculature. However if the location of the fracture has destroyed muscle balance, the closing of the mouth may be obstructed by a short posterior fragment while with a comparatively long distal fragment the bone ends may become too widely separated to permit normal union.

Within the mouth many therapeutic devices have followed the form of a saddle fashioned of wood, cork, gutta percha or vulcanized rubber molded over the edentulous fragment and accompanied by jaw fixation. Waldron, Albee, Ivy, Risdon, Eby, Friedman, Schroeder, Sonntag and Rosenthal, Wassmund and Aufderheide have all used this method. Blair used modeling compound to produce a similar result while Kazanyan employed pronged wire. A drill left momentarily *in situ* by Bickersteth in 1864 while operating on the mandible might be called the precursor of Soule's bone pin graft and the zygomatic screw method used by Pickernill and modified by Coughlin.

Among the European methods Dolamore described the Lindemann-Bruhn application of the nail extension technique. The short fragment

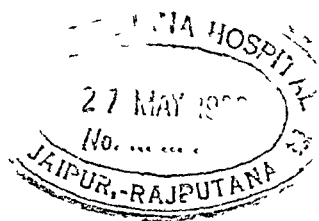
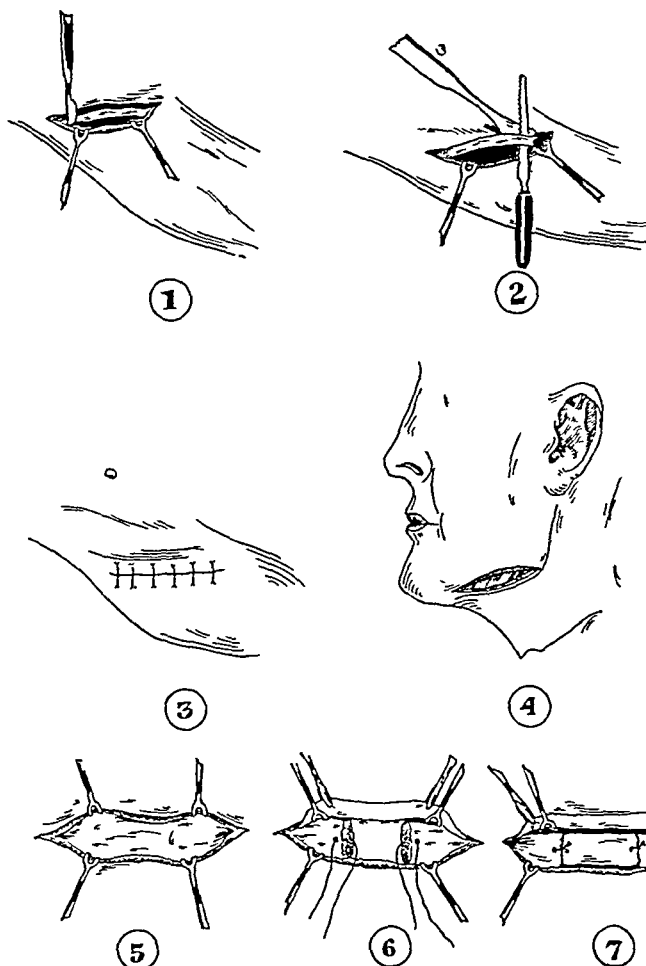


Fig 6 Ivy-Curtis application of the iliac graft 1 Exposure of crest of ilium 2 Method of removing graft 3 Suture of skin incision 4 Incision over jaw defect 5 Exposure of deep tissues 6 Preparation for graft 7 Graft in position

destined site as soon as detaching cross-cuts were made. Phemister anticipated his fixation by boring holes before the bone was moved. Stern applied the "Albee inlay" but used bone pegs. In a recent paper, MacCollum reported the use of the same transplant when a severe facial burn necessitated a mandibular replacement.

Free rib grafts were favored because of their conformability to the contour of the mandible, but to a number of surgeons the risk of damage to the chest cavity incidental to their removal was considered a grave deterrent. This latter view was not shared by Cole, who used the rib for free transplants in the curved portions of the mandible.

Following the technique he used for tibial grafts, plates were attached to the bone before its removal. Eve used the same procedure but specified segments from the tenth or eleventh rib. Phemister chose the seventh or eighth rib for repairing losses in the body of the mandible. Watkins described a somewhat pretentious dovetail graft held by bone pegs. Davenport, too, varied the procedure customarily employed by placing a Sherman plate across the defect, which was fastened to the posterior fragment by two screws. A strip from the fifth rib, cut slightly long, was forced between the fragments and the free end of the plate was screwed to the anterior fragment.

Other operators however have employed direct maintenance of the newly created fragments.

The work of several surgeons is recognized as typical in this somewhat limited field. Probably the earliest case to receive considerable recognition was one reported in 1849 by Hüllihen who incised the alveolus only and unlike the others mentioned used an interdental splint for fixation rather than suture. The next operation to occasion wide spread interest in America was a bilateral resection of the mandible performed in 1897 by Blair who has since advanced several other corrective measures. His choice of ligature was silver wire or chromicized catgut. Harsha and Eisenstaedt Gilmer Pichler Lane and Schultz have reported operations for characteristic cases of maldevelopment in which direct fixation was utilized while Eiselsberg's technique is mentioned frequently in connection with retraction. Others having employed these step or oblique incisions are Kazanjian, Eve and Eloesser. Cryer suggested semicircular incisions at the angles to permit upward rotation of the mandible. Although these procedures are noted with interest the present trend increasingly favors the numerous appliances made available by modern orthodontia.

Repair of Tissue Losses in the Mandible

For cases of recent fracture or for those in which union has been delayed but is unaccompanied by an appreciable loss of osseous tissue suture when used constitutes a primary therapeutic measure. In contradistinction are the cases in which ununited fracture, trauma or surgical procedures have occasioned losses in the bony structure. Here the employment of suture becomes secondary for the main treatment must be designed to restore function by the replacement of the missing substance. Although artificial devices have been used and reported by Hashimoto, Wassmund, Sonntag and Rosenthal Brophy and others, bone grafting is the method of choice.

Bone transplantation particularly in the mandible remained in an experimental stage in spite of brilliant contributions to the osteogenetic aspect of the subject by Oliver, Barth, Senn, Marshall, Macewen, Axhausen and many others. Unquestionably the terrific toll of facial injuries that resulted from the trench fighting in the World War forced an unparalleled demand for bone reparative measures. That the exigencies of the situation were surmounted has been conclusively expressed by Badcock. "The operation of bone grafting as a cure for ununited fractures of the

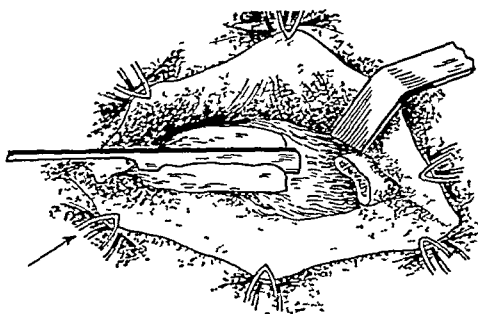
mandible has passed beyond the experimental stage into the region of assured success in a very large proportion of cases.

To the valuable war time experience obtained by the surgeons of the Allies, Dolamore added an analysis of the work done in the German hospitals. One of their most notable offerings was the use of the iliac crest for restorations in the mandible, a measure commonly credited to Lindemann. This procedure has been applied and mentioned frequently by Ivy and Curtis (Fig. 6) who found it applicable to both small and large losses. They drilled holes in the graft and fragment ends for silver or brass wire ligation. Gillies and M. I. Inde considered this graft superior to all other types. For its application they recommended (a) cutting a shaving from the outer surface of the fragment ends to afford greater contact with the overlying iliac section or (b) fitting an accurate end to end union between graft and bone ends. These wedged section transplants were employed also by Munby and Shefford and Chubb.

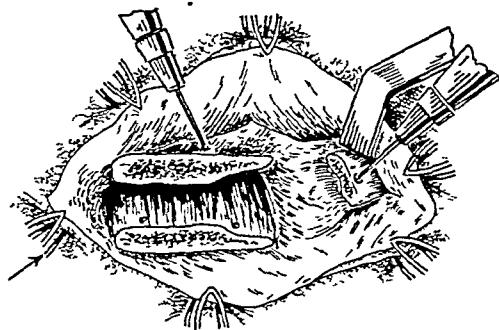
Presumably the wide popularity of the iliac graft has been due to the amount of bone available. For extensive losses in which tibial dimensions fail to provide the needed curve and size, Albee and Weigel and New advocate the use of that portion of ilium adjacent to the anterior superior spine. Waldron and Rydon chose the same bone because it is so much larger than the rib and so much more cancellous and less dense than the tibia. They employed Belgian iron wire fixation. Pickenill, Tainter, Cole, Moorehead and West maintained the transplant with silver wire. Padgett added kangaroo tendon and New and Felt preferred catgut.

The use of the tibia and rib as grafting media antedated that of the ilium. Albee, eminent and enthusiastic exponent of bone graft surgery, placed an unqualified indorsement on the utilization of tibial transplants for losses in the lower jaw. In his opinion, the cortex from the antero-internal surface of this bone approximates the thickness of the mandibular cortex and moreover these bone cells are more active osteogenetically. For his inlay grafts a pattern was laid on the bone in order to cut the segment immediately in the shape that the defect required. Both he and McWilliams employed suture tied across the graft. Lane and Groves used non absorbable suture for they did not consider it inimical to osteogenesis.

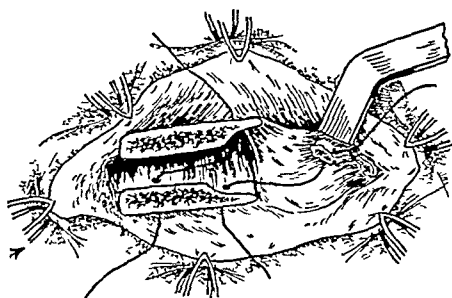
Cole when using the tibia for free transplants made parallel cuts along the bone and attached silver plates at predetermined positions. In this manner the segment could be placed in its



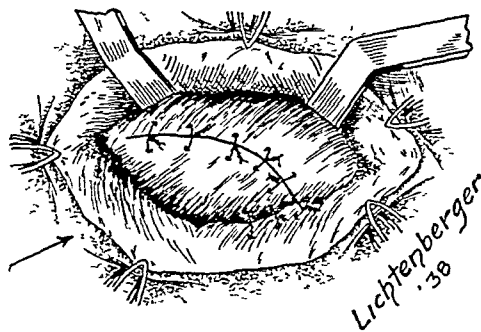
A Removal of pedicled flap from the anterior fragment



B Drilling of suture holes



C Suture wires in place before graft is moved



D Soft tissue closed with interrupted catgut sutures

Fig 7 The Cole pedicled graft.

from the lower border of the anterior fragment. The pedicle was carefully defined by lateral incisions and dissected from the underlying structures, sufficient tissue being freed to allow easy adaptation in its new position. Fine silver wire was passed through drilled holes in the fragments and through the pedicle in order to surround the graft and insure firm contact. The soft tissue was sutured with catgut and the external wound closed with temporary drainage. For fixing these grafts, Cole used catgut first, then kangaroo tendon, and then changed to silver wire because the absorbable suture lacked the requisite security. In 1919, he acknowledged an improvement suggested by Tainter. It consisted in the passing of the fixing wire through the bony transplant instead of around it, which secured firmer and more reliable apposition.

Blair, Ivy, Tainter, Gillies and McIndoe, Gilmer, and Munby and Shefford are among those who followed the "Cole" procedure. Their opinions of the salient features of this method may be summarized as (1) the "Cole" technique is excellent for the repair of losses up to 3 cm in the horizontal ramus, (2) it is not suitable for use

in the ascending ramus, (3) it assures an adequate blood supply since the transplant is an integral part of the mandible, (4) it may result in undue distortion of the normal tissues, (5) the operation is difficult and accompanied by considerable blood loss, (6) the type of graft used is less vulnerable to infection and consolidates more rapidly, and (7) the possibility of a so-called "springy union" should be taken into consideration in conjunction with this technique.

In the same year that Cole performed his noted operation, Blair's text appeared, in which he explained two types of immediate substance grafts: (a) a semi-pedicled graft taken from the mandible itself, and (2) an implanted rib section used in a two-stage operation. Blair as well as Groves discussed the little-used chest flaps. Coughlin, in describing reconstructive operations for the region of the chin, mentioned the clavicle-flap method in which Rydygier employed successive procedures. Imbert and Real, Figi, Silverman, Pichler, and Trauner reported their variations for immediate substance transplants. In these, as in all other phases of maxillofacial surgery, clinicians have found that too great elaboration of operative

Frequent reference is found in the literature to the rib-transplanting method of Gallie Robertson. For a loss in the horizontal ramus slits were cut along the lower border of the fragments which were then forced apart sufficiently to receive a section of rib the piece was obtained by splitting the bone in half through its greatest diameter. The companion strip was placed across the fragments so that the medullary surfaces faced each other and both bone ends were secured by kangaroo tendon. In the main surgeons among them Blair Ivy Groves Pickernil Figg Tainter and Padgett have adopted a uniform method including fixation for all free bone grafts the rib naturally is handled in the same way.

In addition to bony transplants from the rib cartilaginous grafts find occasional application to osseous losses in the mandible. Imbert and Rea Blair McWilliams and others have pointed out the brilliant pioneer work done by Morestin with this substance. Cartilage has been favored by some operators because it can be obtained easily it can be cut and shaped to any contour with an ordinary knife it possesses exceptional resistance to infection and it is not subject to absorption. For extensive losses which include a part or all of the ascending ramus the Gillies operation is classic. A seventh or eighth rib segment containing the costochondral junction was taken from the opposite side of the body and placed so that the bony portion might be wired to the anterior fragment while the costal cartilage formed the ascending ramus. In the complete absence of the ramus a false joint was made in the region of the glenoid fossa.

More frequently the cartilage transplant has found application when the result desired has been cosmetic rather than structural. As early as 1909 Blair reported the use of a section of the eighth costal cartilage for rounding out the chin in connection with a case of mandibular maldevelopment. In these instances the tendency of the graft to retain its original substance and its ability to unite with surrounding soft tissue offer reasonable assurance of a permanent result.

Although the osteoperiosteal graft has come to be linked almost exclusively with the name of the French Army surgeon Delageniere he credited the inception of the idea to Olber whose work in 1835 on tibial periosteum was the first of its kind. The inability to combat sepsis in that pre-Listerian era had however compelled the abandonment of the research. In the application of his method Delageniere believed that the removal of the periosteum alone injured a large percentage of osteogenic cells hence he added to

it a thin layer of underlying cortex keeping the graft to the thickness of a ten cent piece. The tibia was employed because its size was convenient and its periosteum especially vascular. Some years later he effected certain changes in his technique using a one stage operation and metallic suture only infrequently. At other times, he relied upon the intense coaptation of the soft tissue with catgut so held that the graft was assured of contact with living tissue at all points. For reconstruction of the angle of the jaw Delageniere used several pieces of transplant retained by catgut through all layers.

The osteoperiosteal transplant has been adopted by a number of surgeons. The originator's method sometimes with additional comment or modification has been described by Blair Ivy and Curtis Sebleau and Tainter among others. Gillies believed that the graft was valuable when the blood supply was poor. Waldron applied it when the fragments were thin. Dorrance and Wagoner were of the opinion that failures occurred only when the coaptation of graft and fragments was insufficient. Fry stressed the advisability of retaining overlapping strips of periosteum on the graft. McWilliams advocated filling the space between the layers of bone with tibial chips. Albee and Seldin obtained bony union with considerable bone regeneration in an ununited fracture when a double-wedge-end osteoperiosteal tibial graft was maintained by kangaroo tendon. Coughlin employed 3 pieces of bone the 2 longer sections with smooth sides outward overlapped the fragment ends and the third strip laid between them exactly fitted the length of the gap. Catgut fixation was used. An objection to a lack of rigidity in this transplant is readily overcome according to Kazanjian by the addition of several layers of graft.

Pedicled grafts comprise a distinctive group of bone transplant operations. Known as immediate substance grafts they are taken as the name implies from an area close enough to the lost bone to be repositioned without the complete severance of at least a part of the fascial and muscular tissue normally attached to them. This includes of course a complete skin flap. In the literature priority for this type of transplant has been conceded repeatedly to Bardenheuer. Nevertheless Cole who first used the procedure in 1917 undoubtedly did more than anyone else to popularize the operation so frequently prefixed by his name. According to the Cole method (Fig 7) a skin incision was made extending well into the neck and the posterior fragment exposed and prepared to receive the graft which was removed

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detail is not conducive to effective results. The increasing tendency is toward surgical measures which combine adequacy with consistent simplicity. In the field of reconstructive surgery present methods have had a rich heritage of experience augmented notably but by no means exclusively by military surgery.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EAR

Tumarkin, A A Contribution to the Study of Middle-Ear Suppuration, with Special Reference to the Pathogeny and Treatment of Cholesteatoma. *J Laryngol & Otol*, 1938, 53 685

A concise definition of cholesteatoma is difficult, because no definition can include all 6 recognized forms. According to most authorities, all forms of cholesteatoma have one factor in common, namely, the presence of epidermic elements. However, these 6 entities are in essence identical, and are the natural manifestations of varying degrees of infection or other irritation acting on the pavement epithelium, which is the normal lining of certain parts of the middle-ear cleft, viz., the promontory, ossicles, tympanic membrane, aditus ad antrum, mastoid cells, and petrous cells. In fact, middle-ear suppuration may be divided into two types: the cholesteatomatous or pavement epithelium, and the mucopurulent type of ciliated epithelium with its mucus glands lining the eustachian tube and adjacent anterior portion of the middle-ear cleft.

The various theories and hypotheses are discussed at length and the author's own hypothesis is submitted. This is based on the belief that the pavement epithelium, which normally lines the epitympanum and retrotympanum, reacts to infection by proliferating and throwing off paper-like squamæ, the exact form of the latter depending upon associated circumstances. Cases of acute epitympanitis are cited as examples of forerunners of cholesteatoma because of the pavement-like structure of the mucosa in this space.

Further studies on the form and structure of the petrous bone throw some light on the pathogeny of cholesteatoma. In a series of 31 cases of chronic perforating epitympanitis, which would merit the title of secondary cholesteatoma, not one occurred in a fully pneumatized mastoid. It is deduced, therefore, that chronic perforating epitympanitis occurs almost exclusively in association with cellular mastoids and is the precursor of cholesteatoma.

JOHN F. DELPH, M.D.

MOUTH

Blair, V. P., Brown, J. B., and Byars, L. T. The Treatment of Cancer of the Tongue. *Surg Clin North Am*, 1938, 18 1255

It is difficult to avoid the conclusion that the most outstanding need in the solution of the problem of intra-oral cancer is not greater technical knowledge, but better application of certain fundamental factors, the disregard of which bears the major respon-

sibility for our rather poor average showing for this area.

Most cases of cancer of the tongue get beyond the possibility of a five-year control, for one or several of the following reasons:

- 1 The examining physician may have failed to recognize a perfectly characteristic lesion, or he may have wasted too much time in attempting to make a differential diagnosis.

- 2 Misinterpretation of the microscopist's statement that "no cancer was found" as meaning that the patient does not have cancer.

- 3 Failure to impress upon the patient with cancer the importance and success of, and the very slight risk to be feared from, standard methods of treatment in early cases, and that inadequate treatment entails a 100 per cent death rate.

- 4 Given a case which may yet be controlled, the therapist may fall short of meeting his responsibility, either in failing to recognize what is needed or by attempting procedures beyond his skill.

Most cancers of the tongue are of the squamous-cell type. The condition is, as a rule, recognizable from the clinical findings alone by the time the lesion is noticeable, and seldom appears before the age of thirty, but fatalities have occurred because of failure of recognition of the lesion in quite young subjects. There are three local findings, the combination of which should establish a strong suspicion, if not a positive diagnosis, of epithelioma: chronicity, which may have gone unnoticed, induration, and early ulceration. Usually, there is that sharply outlined resistance which a discriminating finger will rarely mistake. Ulceration appears early.

The frankly open ulcer, which is the most common type, occurs on any part of the tongue. The walls of a true fissure ulcer lie in contact, and show but slight induration in the earlier stages. Because of this, the fissure is apt to remain unnoticed until pain and soreness are felt upon movements, or upon lodgment of food in its depth. The most common location of this type of cancer is at or behind the junction of the anterior pillar, and its feeling and appearance are so characteristic that it is recognizable when but a few millimeters in extent.

True cancer pain is usually a late symptom, but it can then be most intense and quite characteristic, especially when the lingual nerve is involved. Any persistent or recurrent pain occurring in the side of the face of an older person, which radiates to the ear and temple, calls for diligent and, if necessary, repeated search.

There is a warty type of squamous epithelioma that is microscopically borderline, clinically slow-growing, which may persist for several years with-

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Of the first group of patients who had undergone complete dissection of the neck, 12 lived five years or longer, 8 lived from three to five years, 4 died from causes other than cancer, in less than three years, 7 died of cancer in less than three years, 7 could not be followed, 5 died postoperatively, and 3 are alive and well, but less than three years have elapsed since the operation.

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NECK

Sunder-Plassman, P. • The Basedow Problem (Zum Basedow-problem) *Deutsche Ztschr f Chir*, 1938, 250 543

It is not possible to compare without reservation the results of thyroid experiments on healthy animals to thyreotoxicosis in human beings. Hormone injections, particularly, are an assault on nature. Attacks of such degree do not occur in the human organism. One should never lose sight of this fact in evaluating the results obtained up to this time from the injection of the thyreotropic hormone of the anterior lobe of the hypophysis. Such injections given to healthy animals produce an increase of epithelium, colloidal dispersion of the thyroid follicle, increased basal metabolism, dispersion of the glycogen from the liver, and hypertrophy of the cortex of the adrenal glands. Three to four weeks later, however, the animals no longer react to the injections, and the changes disappear because, according to Collip and Anderson, and Eitel and Loeser, anti-thyreotropic hormones are formed.

In animals one can find the same changes that are observed in the vegetative nervous system, liver, and heart muscle of patients with Basedow's disease, only when extremely high doses are injected in increasing amounts. In studying the Basedow problem one should not limit his interest exclusively to the thyreotropic hormone. Further, the investigator should not conclude that the nervous system has no influence after he has cut one cervical sympathetic nerve and injected massive doses of thyreotropic hormones. No denervation of the thyroid gland takes place. Due to the neurotomy, the isolated vegetative nervous system becomes increasingly susceptible to physiological irritation. This susceptibility to irritation changes after damage to the

higher vegetative center by radium or electrocoagulation. In every case, the strong preterminal nerve plexus of the thyroid gland plays an important rôle and therefore one should never lose sight of the possibility of the regulatory function. Rieder has already shown, from a clinical point of view, the independence of the peripheral nerve network, in animal experiments one can readily corroborate this. It could be proved that bilateral cutting of the cervical sympathetic nerves does not lead to denervation, as 5 photographs of preparations demonstrate that degeneration does not occur after eleven days. It was found that under the influence of thyreotropic hormone the size of the Schwann nuclei in the preterminal plexus increases synchronously with the activated follicle cells. The nervous terminal reticulum extends over the plasma of the follicle cells and goes, without end, from cell to cell.

Sunder-Plassman is convinced that this nervous terminal tissue is of decisive regulatory importance to the manner in which function of the thyreotropic hormone in the thyroid gland takes place. The author could not prove the existence of anti-thyroid hormone in the course of his animal experiments. He assumes a general change of reaction of the organism because of immune biological reactions which are based partially on protein components. Upon sensitizing rabbits with simple hog serum, he found that the effect on the thyroid gland was suppressed even when he used large amounts of thyreotropic hormone.

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(FRANZ) NOAH D FABRICANT, M D

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All clinical diagnosis should be checked by biopsy but when the microscopic findings are at variance with characteristic clinical findings it is much safer to credit the latter rather than the former. The microscopist's report has frequently been misconstrued. The biopsy specimen having been taken from the protective inflammatory wall that is often thrown around the growth may not include any part of the true growth.

Some estimate of the virulence of a growth may be arrived at from both the clinical and microscopic pictures. The latter may vary in different areas of the same growth. In the prognosis from the clinical findings the location, the rate of growth (which at times is difficult to estimate), the character of the ulcer and of the induration and the rapidity with which glandular involvement if present has occurred must be taken into consideration. It is an old observation that the cancer which grows toward the observer is as a rule much less malignant than the one that grows toward the patient.

Treatment requires total destruction not only of the local lesion but also of the cancer cells that have metastasized. There are two ways of accomplishing this. One is by mass removal or destruction of the evident growth along with an estimated amount of the surrounding tissues that might be involved. This can be done by sharp knife or cautery dissection, cauterization with heat or by the use of one of the various types of electric coagulation. The other method is that of selective destruction of the individual cancer cells by radiation, care being taken to avoid fatal damage to the normal tissues that may have been invaded. Mass removal still remains the more efficient plan in the treatment of actually or potentially involved lymph nodes that are still operable.

For the past ten years except for the removal of a biopsy specimen we have practically abandoned surgery in favor of radiation for the control of the local growth. Radiation is used for all but some of the far advanced growths that have also involved other areas. At first the radium element in 50 or 125 mgm. needles was used but later we changed to the use of radon in gold seed containing 1 or 1½ mc of radium emanation in the proportion of 1 mc to each cubic centimeter of tissue treated and so far we have had no reason to change.

There are three classical operative approaches to the tongue that are worthy of mention: (1) the Whitehead intra oral extirpation of half or all of the tongue with or without splitting of the cheek as practiced by Butlin and with the amputation of the tongue and the removal of the lymphatics being done at two separate sittings; (2) the Kocher submaxillary approach which is more effective than the Whitehead operation when the floor of the mouth on one side is already involved and (3) the bilateral hyoid submaxillary approach which permits complete removal of the lymph nodes from both sides in the upper half of the neck gives access to the tongue pillars and adjacent parts of the pharynx and makes possible satisfactory deep cooking cauterization of the body of the lower jaw with a heavy soldering iron when it has become invaded.

An uncontrolled cancer of the tongue will sooner or later disseminate to the cervical lymphatics or the related drainage areas.

Some time after we began to rely entirely upon radium or radon implantations in the tongue we realized that a fairly large percentage of patients developed advanced or inoperable gland involvement before we had the opportunity of doing a secondary operation on the neck nodes. We now by preference implant the radon seeds or needles and at the same time (or the day following) dissect the neck. This procedure is the rule in all cases except those in which satisfactory after treatment and observation can be carried out. We do not consider that the presence of enlarged or definitely cancerous glands is necessarily a contraindication but then their removal is less likely to control the disease and the operation will not be so free from danger.

If at the time the patient is first examined the nodes are found to be widely fixed *en masse* to a large area of skin or carotid sheath or at all adherent to the vertebrae the mastoid process or the larynx operation should not be attempted. If the patient is so situated that a properly executed Couillard series of exposures can be given that to us would seem to be the procedure of choice.

Not all cancers can be cured by surgery or irradiation but the incurable cases cannot always be identified before the attempt is made. Therefore it is not reasonable to withhold treatment when there is the possibility of control of the condition even at some risk to life.

The total number of cases of personally observed primary cancer of the tongue for which clinical records are available is 123. From a recent analytical review of these the following somewhat meager data were obtained.

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(FRANZ) NOAH D. FABRICANT, M.D.

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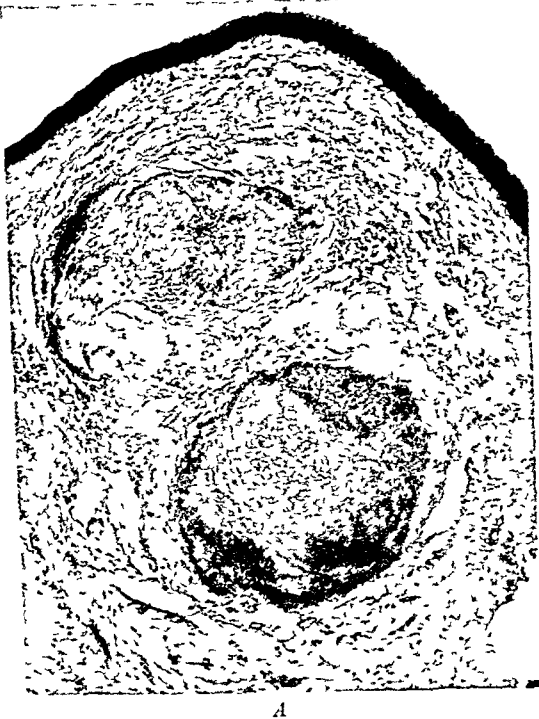
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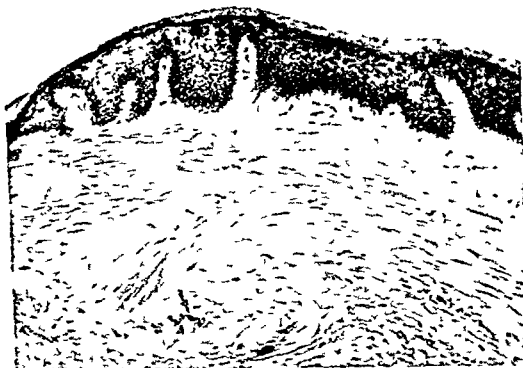
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A



B

Fig 2 A, vascular inflammatory tumor (pseudangioma) containing two thrombosed vessels, B, inflammatory tumor with subepithelial fibrosis (pseudofibroma)

ble, it can be removed with the guidance of the indirect mirror laryngoscope, but in children and in adults of a nervous temperament, suspension laryngoscopy is the most suitable method of visualizing the lesion for treatment. For direct endoscopic laryngeal operations, the authors almost always use the Lynch suspension apparatus, through which an



Fig 3 Multiple papillomas of the larynx (photographs)

excellent view of the interior of the larynx can be obtained.

At the clinic two methods are generally employed for eradication of these tumors (1) excision by use of the laryngeal forceps or a scalpel and (2) destruction by diathermy (electrocoagulation). Diathermy, when used, should not be carried out too vigorously, in the treatment of a benign tumor there is no need of destruction of large amounts of normal tissue, which might result in stenosis or at least in impairment of the quality of the voice. Severe dyspnea should receive prompt attention before any treatment of the tumor is instituted.

With few exceptions, all benign tumors of the larynx should be removed, not only because they interfere with phonation and obstruct the larynx, but because of the possibility that a few of them may become malignant.

At the clinic 194 cases of papilloma of the larynx (Fig 3) have been observed. One hundred and twenty-one, or 62 per cent, of the patients were male, 73 or 38 per cent, were female. For the past few years diathermy (electrocoagulation) has been used almost entirely at the clinic in the treatment of papillomas. By the use of a small amount of current, which is carefully controlled, each individual papilloma can be lightly touched with the positive electrode, this method quickly destroys the tumor without affecting the underlying tissues.

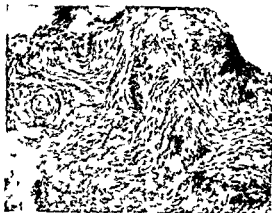


Fig 1. Fibroma of the larynx

Using the term neoplasm to imply a true tumor and the word tumor itself to denote any abnormal mass of tissue they have attempted to separate benign laryngeal growths into two primary groups: *neoplastic and non neoplastic tumors*. In 329 cases (45.6 per cent of the entire series) the lesions were listed as neoplasms. This group was subdivided into three: (1) tumors of epithelial origin under which were classed 1 case of adenoma and 194 cases of papilloma; (2) tumors of connective tissue origin under which were classed the 6 cases of fibroma, 1 case of neurofibroma, 1 of fibrolipoma, 7 of chondroma and osteochondroma, 26 of angioma and 58 of myxoma; and (3) 35 cysts. There were 393 cases of non neoplastic tumors (54.4 per cent) in the whole group. These lesions consisted of inflammatory tumors, 33 cases; xanthomas, 4; amyloid tumors, 18; epithelial hyperplasia and leukoplakia, 33; and prolapse of the ventricle, 6.

Although many hypotheses have been advanced to explain the formation of benign tumors their actual cause is still unknown. In the larynx probably the great majority of benign tumors are the result of a chronic inflammatory process.

Although benign tumors of the larynx can occur at any age they are most frequently encountered in middle aged persons. From thirty five to fifty is the age at which these tumors most commonly develop. Five hundred and six, or approximately 70 per cent of the 722 patients were men, 216 or 30 per cent were women.

Benign tumors are composed of well differentiated cells which displace rather than infiltrate tissues. They never metastasize. In the larynx they produce symptoms by compressing the adjacent tissues by mechanically interfering with the vocal mechanism or by obstructing the respiratory tract. The benign tumors of this series varied in diameter from less than 1 mm. to proportions commensurate with the size of the entire laryngeal lumen. Most of them measured 3 to 5 mm. in diameter. The pathology

of each lesion in the classification is reported in detail in the complete paper. Only a few will be mentioned in this abstract.

A fibroma is a tumor composed of tissue which resembles fibrillar connective tissue (Fig. 1). The 6 fibromas which were encountered at the clinic were soft pedunculated tumors consisting of young loose areolar tissue and numerous blood vessels and they were infiltrated with wandering cells. They ranged from 2.5 mm. to 2.5 cm. in diameter. Fibromas are true neoplasms and are not to be confused with inflammatory tumors that have undergone fibrosis; the latter growths occur frequently in the larynx while true fibromas are rather rare.

Inflammatory tumors are the most common of all benign laryngeal growths. In this series 332 tumors were definitely inflammatory. On microscopic section 40 per cent showed simple inflammatory tissue, 20 per cent were hemorrhagic, 2 per cent were vascular (Fig. 2A), 37 per cent were fibrous (Fig. 2B) and 1 per cent were granulomatous. Areas of hyaline degeneration were present in 10 per cent of these tumors. These types of inflammatory tumor represent various phases of cellular activity which occur in an inflammatory process. Endothelial cells may proliferate to form capillaries and vascularize the tumor. In some cases the fibroblasts are activated and areolar connective tissue is formed and fibrosis produced. In an inflammatory region hemorrhages occur frequently. The development of a granuloma in or around a contact ulcer represents nature's attempt to heal the ulcer.

Clinically inflammatory tumors appear as fibrous nodules, polypoid tumors, pedunculated tumors, inflammatory thickenings, papillary growths and contact ulcer granulomas.

The site of predilection for benign tumors of the larynx is the vocal cords. Five hundred and fifty five tumors were situated on the vocal cords, 292 occurred on the right side and 246 occurred on the left side, 17 were situated in the anterior commissure.

There are no symptoms characteristic or diagnostic of benign tumor of the larynx. Hoarseness is the most constant symptom. Including the 32 cases in which there were no laryngeal symptoms, hoarseness was absent in only 35 cases. The most serious symptom is labored breathing or dyspnea. Several of the patients, especially those with multiple papillomas, gave a history of persistent mild respiratory obstruction and occasional attacks of violent choking. In evaluating any symptoms the functional element must always be taken into consideration. Coughing is not an outstanding symptom of benign laryngeal tumors.

In the differential diagnosis, benign tumors of the larynx must be distinguished from malignant tumors: tuberculomas, syphilomas, acromegaly of the larynx, blastomycosis and torulosis.

The treatment of benign tumors is based on the size, position and nature of the growth and on the age and general physical condition of the patient. In adult patients if the growth is small and acces-

that this preference for irradiation is not due to any operative risk, not one of the conditions mentioned is a contraindication to laryngofissure in a properly prepared patient. The preference is based on the fact that irradiation has now reached a degree of efficacy that renders it probable that the patient will live out his short expectancy without recurrence after irradiative arrest. The extent to which the conditions mentioned are to be regarded as contraindications to irradiation must be decided in the particular case.

Any attempt to save the life of a patient, otherwise doomed to death by malignant disease, is not only justifiable but laudable. There is no question as to the accessibility of the back wall of the larynx by lateral pharyngotomy, but the early results were so discouraging and the recent results of irradiation have seemed so surprisingly good by comparison, that cancers of the posterior laryngeal wall should be placed in the extrinsic class, for which irradiation is preferable to operation.

3 What is the bearing of the degree of malignancy on the choice between operation and irradiation?

Laryngofissure is advisable for every small early growth anywhere in the intrinsic area in a patient free from general organic disease regardless of the degree of malignant aggressiveness.

For an advanced but still intrinsic growth of Grade 1 or 2 in a patient free from other organic disease, laryngectomy is preferable, but irradiation is preferable for cancer of Grade 3 or 4.

For intrinsic growths with glandular metastases irradiation is preferable regardless of grading.

In a general way it may be said that extrinsic growths are less amenable to operation and more amenable to irradiation as compared with intrinsic lesions. Tumors of Grade 4 are more sensitive but yield results less permanent than those obtained in

tumors of Grade 1. Grades 2 and 3 are relatively similar but less sharply contrasted.

4 Is it justifiable to do a laryngectomy for a small malignant growth in the anterior commissure?

It is universally accepted that it is best, in dealing with a malignant tumor anywhere, to remove the growth with an adequate area of surrounding normal tissue without cutting into the neoplastic tissue. The only question to be determined, in the case of laryngeal cancer, is whether or not this can be done without extirpating the whole larynx. Laryngectomy is perfectly justifiable and proper if the surgeon's experience leads him to believe that in performing it he is acting for the best interests of the patient. However, since the development of the anterior commissure operation, the authors have found that it is not necessary that the whole larynx be sacrificed in such cases. It should be stated that before the anterior commissure operation is done it should be ascertained in each case that the growth is small. Certainty is the result of systematic pre-operative examination by direct laryngoscopy, external palpation, and roentgen examination of the neck.

5 In view of the later improvements in the technique of irradiation is the surgeon not justified in doing fewer laryngectomies?

The present experience is sufficient to warrant the belief that the future will probably see a progressive decrease in the number of laryngectomies. One obvious reason for this is that, whereas formerly the surgeon was justified in taking desperate chances with laryngectomy when the patient's general life expectancy was short because of the 100 per cent mortality without treatment, the greatly increased efficiency of irradiation indicates that laryngectomy should now be limited to those surgical subjects who have a good general life expectancy.

SAMUEL KAHN, M D

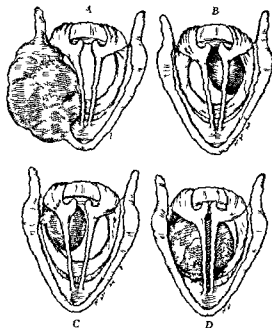


Fig 4 A chondroma involving the substance of the right ala of the thyroid cartilage B chondroma arising from the cricoid cartilage C chondroma arising from the cricoid cartilage D chondroma arising from the lower half of the right ala of the thyroid cartilage E tumor situated below the vocal ligaments

Chondromas of the larynx are of interest because of their character and rarity. The great majority of chondromas of the larynx involve the thyroid or the cricoid cartilage and usually arise from its inner surface. A few have been recorded as originating from the epiglottis or from the arytenoid cartilages. In 4 of the 8 cases the tumor was attached to the thyroid cartilage and in 4 to the cricoid cartilage.

Since chondromas of the larynx are encountered infrequently, the diagnosis may offer some difficulty. An examination of the neck may reveal fullness of the thyroid or the cricoid cartilage or an actual mass. On palpation such a tumor has a nodular surface and is extremely hard. Strongly suggestive of a chondroma is an external tumor that is fixed to one of the laryngeal cartilages, is not tender, is hard on palpation and is unassociated with signs of inflammation or adenitis. On laryngoscopic examination if the growth extends into the laryngeal lumen, a rounded tumor is seen that is covered with normal unulcerated mucous membrane in which blood vessels stand out prominently. Impaired mobility or actual fixation of one or both vocal cords may be noticeable. A probe passed into the larynx will give evidence of the hard character of the mass. Difficulty in diagnosis may be encountered if the lesion is large and arises from one lamina

of the thyroid cartilage and pushes all the internal structures of the larynx to the opposite side. Furthermore, a chondroma in the subglottic region may be entirely overlooked. Of particular importance as diagnostic evidence of a chondroma is the use of the roentgenogram.

The method of treatment of a chondroma of the larynx depends on the size and situation of the lesion. Laryngectomy should be performed only when the growth is so extensive that to effect a cure would necessitate the removal of all or almost all of the cartilaginous support of the larynx. Recurrences of the growth after removal are unlikely if the chondroma has been thoroughly eradicated.

In Figure 4 an attempt has been made to show somewhat diagrammatically the relation to the thyroid and the cricoid cartilage and to the vocal ligaments in several of the cases of this series. In the complete paper special consideration was given to the various benign tumors of the larynx. Only a few have been taken up in this report.

Jackson C and Jackson G L. Cancer of the Larynx. *J Am W Ass* 1938 111 1980

The literature of malignant disease of the larynx is so voluminous that new presentations should have a bearing only on the as yet inconclusively determined phases of the subject, especially those that seem to call for a revision of opinion.

1. Is the physician justified in limiting the use of irradiation to cases in which operation is contra-indicated?

Deduction from statistics has led the authors to believe that the physician is scarcely so justified and that for the present laryngofissure should be preferred to irradiation in cases of early intrinsic cancer. There are cases in which total laryngectomy may still be regarded as the treatment of choice. The indications for laryngectomy have recently been very clearly stated by Schall who has also given convincing proof of the excellent psychic and social adjustment made by most of the patients despite the mutilating and crippling character of the operation.

2. Where shall the line be drawn between cases for operation and cases for irradiation?

Clinical experience seems to indicate that in the case of cancer of the epiglottis the line between operation and irradiation is to be drawn between the small, extremely early lesion located centrally on the tip, which is an operable lesion and a growth below the margin by origin or extension, which is of questionable operability. For all growths of the latter class irradiation is the first choice.

For a small, early growth located within the intrinsic area in a patient otherwise free from organic disease, laryngofissure is the method of choice. On the other hand, for a patient with such a growth whose life expectancy is seriously shortened by diabetes, pulmonary tuberculosis, cardiovascular disease or other organic disease, irradiation should be given. It cannot be too strongly stated, however,

Bucy, P. C. The Treatment of Brain Abscess *Ann Surg*, 1938, 108 961

In this article, 17 consecutive cases of abscess of the brain treated by operation are discussed. Five patients died, 3 with the primary infective process in the lung, 1 was admitted in extremis, and the last had a particularly fulminating type of temporal-lobe abscess which arose secondarily to otitis media.

It is interesting to note that 4 patients with cerebellar abscess were treated surgically and all recovered. A fifth case was added after the article went to press, the patient in this case was treated vigorously with sulfanilamide.

The method of draining the abscess in two stages is carefully described and is the author's method of choice. However, in some cases it was expedient to aspirate the abscess, or to enucleate it, or to do both. In many cases a one-stage procedure had to be done.

Many of the cases are fully and carefully reported, and all data are available, comparisons with the views of other neurosurgeons are made.

ADRIEN VERBRUGHEN, M D

Howie, T. O. The Otolologist's Part in the Investigation of Suspected Brain Tumors *Proc Roy Soc Med, Lond*, 1938, 31 1424

The differential diagnosis between suspected brain tumor, producing symptoms such as deafness, nystagmus, and perhaps vertigo, and a lesion of the inner ear is difficult. A peripheral lesion produces impairment of the functions of both cochlear and vestibular portions of the eighth cranial nerve, tinnitus, proportional loss of function in the horizontal and vertical canals, and a proportional decrease in the reactive nystagmus and vertigo to stimulation. These symptoms are in contrast to those produced by a central lesion in which there is normal hearing but disturbances of the vestibular function, normal responses to stimulation of the horizontal canals, but loss or impairment of responses from the vertical canals, normal vertigo and nystagmus, but loss of past-pointing or of falling reaction, and normal vertigo, but impaired nystagmus (or the reverse) from the stimulation of any canal. The author's routine examination in lesions of the posterior fossa producing symptoms referable to the middle ear is described. In addition to the commonly used tests, the author has added the positional nystagmus test carried out by Nylen. A detailed description of the test is given, and nystagmus was found in 90 per cent of the cases of tumor in the posterior fossa whereas by the usual methods of examination it was found only in from 50 to 60 per cent. Positional nystagmus was found in only 4 per cent of the cases in which the tumor was situated in the anterior or middle cranial fossa, or in the spinal cord.

It has been the author's experience that it is difficult to give accurate localization in lesions of the posterior fossa before the onset of increased intracranial pressure. It is hoped that the use of the positional nystagmus test will improve the diagnostic results.

ROBERT ZOLLINGER, M D

Schnitker, M. T., Cutler, E. C., Bailey, O. T., and Vaughan, W. W. The Chromophobe Adenomas of the Pituitary Gland *Am J Roentgenol*, 1938, 40 645

The basis of this exhaustive study is the series of 88 cases of chromophobe adenoma of the pituitary gland seen at the Peter Bent Brigham Hospital from January 1, 1928, to January 1, 1936. The object of the study was the determination of the place of roentgen therapy in the treatment of this particular condition. Eighty-one of the 88 cases were verified at operation, and 39 had been treated by roentgen therapy only. In the cases in which the histological nature of the lesion was determined by examination of most or parts of the tumor, the objective was to discover which of the lesions were most susceptible to irradiation. Of the 81 patients on whom operation was performed, 33 were treated by operation only, and 42 by operation plus irradiation. The value of both treatments was determined primarily from the improvement in the visual acuity and visual fields, and the duration of visual improvement, and secondarily from the general improvement of the patient. From this study it appeared that those undergoing operation plus irradiation showed more improvement than those undergoing operation only. Eleven of the 81 patients had cystic tumors, and their response to irradiation was not as satisfactory as that of the others. The 7 patients with clinically typical chromophobe adenomas of the pituitary gland who received only roentgen therapy had somewhat more satisfactory responses than those of the rest of the series.

For the purpose of the histological studies, the tumors were divided into sinusoidal and diffuse types. The sinusoidal type gave a better response to irradiation. Three of the sinusoidal and 8 of the diffuse tumors were cystic.

The technique of the roentgen therapy used in this series is described and consists of the administration of 9 treatments of 300 roentgens each on successive days to successive portals, each temporal area and the forehead being used. This gives a total of 2,700 roentgens in the entire series. This is repeated after two months. During the interval the visual fields and visual acuity are checked from every two to four weeks.

The authors conclude that unless there be urgent necessity for saving the vision, chromophobe adenomas of the pituitary gland should receive a trial of irradiation therapy before recourse is made to surgery.

ADRIEN VERBRUGHEN, M D

Nessa, C. B. The Effect of Treatment of Brain Tumors with Roentgen Rays. A Review of University Hospital Cases *Radiology*, 1938, 31 670

The literature relating to the roentgen treatment of brain tumors is reviewed briefly. The factors used in the different clinics have varied so widely up to the present time that attempts to correlate separate reports would be futile. To make future studies of value, all steps in the treatment of brain tumors

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Jefferson G. On the Saccular Aneurysms of the Internal Carotid Artery in the Cavernous Sinus *Brit J Surg* 1933 26 267

Jefferson reported 16 cases of saccular aneurysms of the intracavernous portion of the carotid artery. Several cases are illustrated to great advantage with photographs of the patients and their x ray films. In the past fifteen years Jefferson has personally observed 55 cases of intracranial aneurysms and on this basis he has conceived certain ideas relative to anatomical type clinical findings and treatment of such aneurysms.

Generally speaking there can be only one paralytic syndrome of intracavernous aneurysm but sub groupings can be made and supported clinically in the exact anatomical location of the lesion. They can be grouped as:

1. The posterior cavernous syndrome with involvement of the entire trigeminal nerve with ocular palsies but sometimes only with abducens palsy the motor root of the trigeminal nerve may escape.

2. The middle cavernous syndrome in which the ophthalmic and maxillary divisions are affected but the mandibular is spared. There is paralysis of one nerve at least although usually it affects all of the nerves supplying the extra ocular muscles.

3. Anterior cavernous syndrome in which the first division of the trigeminal nerve is affected the other two divisions being spared. There is paralysis of the superior division of the oculomotor nerve or all the nerves to the extra ocular muscles may be paralyzed.

Facial pain, ocular motor paralysis and headache are constant signs of aneurysm of the intracavernous carotid artery. Aneurysms do not cause anesthesia of the face which is sometimes found to be present in patients with tumors of the trigeminal area of the middle fossa. Meningiomas may involve the cavernous sinus if they are small and located on the medial wall of the middle fossa but they differ from aneurysms in that they frequently cause monocular amblyopia or blindness and occasionally paralyze the nerves in the wall of the cavernous sinus. Aneurysms are likely to have a reverse effect.

The advisability of treating the aneurysm by tying of the carotid intracranially or in the neck is discussed and its dangers are pointed out.

JOHN MARTIN, M.D.

Jorns G. The Formation and Absorption of Cerebrospinal Fluid in the Cerebral Ventricles (*Zur Frage Entstehung und aufsaugung in den Hirnventrikeln*) *Arch f. kl. Ch.* 1935 191 574

The physiology of the cerebrospinal fluid is the basis of general brain surgery. Dandy has in his

putably established the fact that the source of the fluid is the choroid plexus. When he blocked off one foramen of Monro a hydrocephalus occurred only in the isolated lateral ventricle when he removed the choroidal plexus in it the hydrocephalus disappeared.

Guleke confirmed Dandy's findings but discovered the surprising fact that after blockage of the aqueduct of Sylvius only one fifth of the cases of internal hydrocephalus could be demonstrated after from nine to twelve months. Heidrich obtained the same results. Fluid exits from the third ventricle do not exist. Guleke could also show that the venous outflow through the great vein of Galen played no role. Thus there are but two possibilities either decreased fluid production or increased absorption in the ventricles.

From the clinical experience of Guttman and the experimental results of Guleke there arises the postulation of a resultant increase of fluid absorption in the ventricles themselves. The vascular plexus again comes under question at this point. An attempt at explanation is made by means of the use of acid colloidal vital stains. However no conclusion concerning the most favorable places of resorption in the ventricles can be drawn. More over dissolved substances such as a 10 per cent solution of sodium iodide only follow the laws of diffusion and osmosis and how that under physiological conditions no resorption of the normal fluid occurs inside of the ventricles. The sole exit from the ventricles is through the aqueduct of Sylvius into the basilar cisterns. As to the theory that the fluid is absorbed into the blood vessels through the walls of the ventricles is poorly supported. After these considerations there is left only the possibility that the decrease of fluid secretion occurs through the vascular plexus.

It has to be sure been observed by Guttman that a reflex influence on the secretory function of the plexus must be considered. Reichardt has already referred to the fact that many findings speak for the existence of centers on the floor of the fourth ventricle which influence the fluid shift between the cerebrospinal fluid and the brain. Also Jorns' dog experiments perhaps support this possibility since he found a few days after closure of the aqueduct a tremendous damming up of fluid only this filled state of the ventricles came about gradually so that it was a question of decreased production of the fluid. Further experimental confirmation is greatly to be desired. Inasmuch as Guttman has made corresponding observations in human beings with normal ventricles in cases of certain closure between the ventricle and the external cisterns this presumption takes on the appearance of probability.

(FRAN.) JOHN MARTIN, M.D.

flow incontinence, automaticity, and true incontinence. The first three of these occur in transverse lesions of the cord above the lumbar center. An automatic bladder never develops after destruction below this center, and incontinence may follow. The mortality in lesions of the cord, from urinary infections and bed sores, is emphasized to be as high as 80 per cent. Non-catheterization, with manual expression and antiseptic therapy, is the ideal way to avoid urinary sepsis and hasten automaticity. This method is without value and is dangerous in the presence of infection. In urinary infections retention catheters, irrigated periodically or by the continuous tidal method, may be used, or a cystostomy may be performed. It is pointed out that the care of a suprapubic tube is much simpler over a period of many months than the retention catheter *per urethram*. The author emphasizes the value of prompt, precise, and consistent attention in the care of the paralytic bladder to avoid urinary infection.

ROBERT ZOLLINGER, M D

Cohen, I. Epidural Spinal Infections. *Ann Surg*, 1938, 108, 992

Infections of the epidural space, abscesses or granulomas are excessively dangerous and their early recognition and prompt surgical treatment may be life-saving. Most of the infections result from metastatic infection arising from a distant source: boil, paronychia, felon, or abscess, although some arise from a localized area of osteomyelitis that is spreading. Once involved, whether by a metastasis or by spread from a vertebra, the lesion in the epidural space is made up of a varying amount of pus and granulation tissue with varying degrees of extensiveness. The seriousness of the disease is due to the damage done to the cord. In the few cases in which careful histological studies have been made, the changes noted have been out of proportion to the pressure of the abscess. These changes have been believed to be due to the local interference of the blood circulation in the cord.

In the acute cases the history given by the patients is very uniform and the course of the disease varies but little, and that in its time elements. The onset is marked by pain in the back, varying in its site but of an extreme intensity. This period is accompanied by fever varying from 100 to 104° F. In a few days up to about two weeks, neurological signs make their appearance. Early there are tingling and numbness in the legs, weakness of the legs or bladder disturbances, and then paralysis. The rapidity with which the paralysis progresses may vary greatly. In some cases it may go on to a complete flaccid paraplegia within a few hours after the onset. The sensory changes are not as constant as the motor changes though most often there will be found loss of sensation below the level involved. Two additional observations may be of help. There is usually a polymorphonuclear leucocytosis, and frequently lumbar puncture will reveal a block on jugular compression. The total protein content is

high and there may be, though not necessarily so, a pleocytosis.

More than a word of caution is needed in the advocacy of lumbar puncture. Regardless of the site of origin of the infection in the canal many patients will have pus in the epidural lumbar space because of a gravity abscess. There exists, then, the obvious danger of traversing the layer of pus and infecting the subarachnoid space, which would initiate a meningitis. If the diagnosis be suspected, the stylet should be removed from the needle after the skin has been traversed. In this way pus would be obtained before the dura is reached.

The condition must be differentiated from polymyelitis, spinal-cord tumor, and especially metastatic tumors.

There is only one treatment for acute, epidural spinal abscess, and that is prompt operation, since, as far as can be determined from reported cases, no patient with epidural spinal abscess has lived unless operated upon.

Of the 7 cases reported, 2 showed complete recovery and 1 showed some improvement.

JOHN WILTSIE EPTON, M D

Stammers, F A R. Spinal Epidural Suppuration, with Special Reference to Osteomyelitis of the Vertebrae. *Brit J Surg*, 1938, 26, 366

The author reports 8 cases of spinal epidural suppuration. A discussion of the anatomy of the spinal epidural space is given to explain the limited localization of such suppuration to the dorsal aspect of the dura and the possibility of extension through the intervertebral foramina, but not into the cranium because of the firm attachment of the dura about the foramen magnum. In 3 cases the infection was secondary to acute staphylococcal osteomyelitis of the laminae, in 1 case to tuberculous disease of a lamina, in 1 case to a suppurating tubulodermoid passing through a spina bifida, and in 1 case to a suppurating sacrococcygeal sinus. Another case was apparently secondary to osteomyelitis of several laminae. The epidural abscess was of the localized type in 3 instances, with the usual symptoms from mechanical pressure on the cord, similar to those produced by neoplasm. Emphasis was placed on certain common signs and symptoms found in the 5 patients with diffuse suppuration. All complained of pain in the back as the first symptom, with the subsequent development of stiff spines.

There was absolute limitation of flexion of the spine, in contrast to free and painless hyperextension. The rapidity of development and extent of the stiffness of the spine paralleled the extension of the epidural abscess. There was hyperpyrexia in all of the cases.

The author concludes that there is a combination of signs and symptoms indicating ascending spinal meningitis secondary to infection in the spinal epidural space. If the patient is not very toxic, an insignificant abnormality, such as a tubulodermoid, a sacrococcygeal sinus, or a septic embolism in the

must be carefully standardized. There must be as Deery suggests (1) exact description of the location and size of the tumor (2) exact statements as to the operative procedure (3) standardization of the pathologist's evaluation of malignancy and (4) general acceptance of adequate dosage and technique.

The author reports the results obtained by irradiation in a series of 44 cases in which the diagnosis was proved by biopsy or necropsy. An attempt was made to determine whether the favorable response obtained clinically in certain patients could be attributed wholly or chiefly to irradiation.

The treatment factors were as follows: 200 kv peak voltage, 30 ma current, filter 1 mm of copper plus 1 mm of aluminum, 60 cm TSD, 50 by 10 cm fields, half value layer 1.3 mm of copper and an output of 27.2 roentgens/min measured in air. Three hundred and fifty roentgens were given every other day to 1 portal and from 2 to 4 portals were irradiated (depending on the location of the lesion) until a total dose of 2,400 roentgens had been given. This occasionally has been repeated up to five times at from two months to three month intervals. Of the 44 cases described, 25 received but 1 course and 19 received 2 courses of treatment.

The 44 cases which form the basis of this report are tabulated as to the nature of the tumor and the results obtained. Fifteen of a group of 24 brain tumors diagnosed clinically showed improvement for periods varying from one to seventy-two months. It is quite certain that improvement in 9 of the 15 was due chiefly to x-ray therapy. Twenty-five of a group of 38 brain tumors proved by biopsy or autopsy showed clinical improvement. There seemed to be fairly definite evidence that the improvement in 9 of the 25 should be attributed chiefly or entirely to x-ray therapy. Six of the 44 cases terminated fatally during or soon after treatment and the author discusses these as a separate group. The case histories of 3 patients are given in detail to illustrate the interpretation of improvement.

From this study it would appear that roentgen therapy in certain cases of brain tumor is responsible for remarkable responses. One of the impressions gained is that the dosage should be materially increased.

ADOLPH HARTUNG, M.D.

SPINAL CORD AND ITS COVERINGS

Coleman C. C. and Meredith J. M. *The Treatment of Fracture Dislocation of the Spine Associated with Cord Injury*. *J. A. M. A.* 1938 111: 2708

In 1925 the authors were of the opinion that a positive subarachnoid block, as demonstrated by a positive Queckenstedt test, demonstrated early was an unequivocal indication for laminectomy unless the dislocation was so extensive that it showed conclusively that the cord was crushed. Larger experience with the Queckenstedt test has removed the earlier optimism regarding the cases in which a frac-

ture dislocation has been suffered with immediate loss of all function below the site of the dislocation. Examination of the cord at operation in complete lesions usually shows a pulpy mass of disintegrated cord tissue with nothing between the examining finger and the bodies of the vertebrae except pia tissue. In none of the cases has the pressure been due to an extradural or extramedullary clot, although in a few instances the laminae may have been fractured and driven into the cord. One of the reasons for the futility of laminectomy is that the maximum damage is done at the time of the injury and partial or complete recoil of the displaced vertebrae is the rule in fracture dislocations. Therefore, cord lesions are usually not progressive since the maximum damage is usually manifested immediately and if the cord has not been crushed, considerable recovery extending over a long period of time may be expected.

Skeletal traction has been employed in both the complete and the incomplete cord injuries. In the former it sometimes relieved pressure on the nerve roots with consequent relief of root pains, whereas in the incomplete lesions it prevented further injury from bone and did not involve the risks present in laminectomy nor that of narrowing the spinal canal in forcible reduction of the fracture dislocation by hyperextension.

In the treatment of incomplete cord lesions, skeletal traction is carried out for from eighteen to twenty-four hours. After this, if the cord lesion is stationary or increasing and the block continues, laminectomy is indicated.

In the treatment of incomplete dorsal injuries the authors prefer to perform a laminectomy first and then to employ hyperextension. In the lower dorsal and upper lumbar region the correction of deformities of the spine is important because of the longer life, the greater range of activity of these patients and the decrease of root pains with normal alignment. In injuries involving the cauda equina, operation is indicated even when fracture dislocation seems to have yielded a complete nervous lesion. The nerves involved have a much greater potentiality for repair than the cord and if the operation is too long delayed, it may not be possible to get as good a result.

Laminectomies were performed in 10 of the 83 cases analyzed in this paper. Five were done in the cervical region and 5 below this area. One of the cervical cases showed improvement; it presented a subarachnoid block. Of the 5 patients with laminectomy of the dorsal or lumbar regions, 3 were benefited.

JOHN WITZKE EPPRO, M.D.

Hilman F. *The Treatment of Paralytic Bladder in Cases of Spinal Cord Injury*. *Surg.* 1928 4: 649

A review is given of the physiology of micturition and the various methods recommended in the treatment of a paralytic bladder in cases of spinal-cord injury. Following a transverse lesion of the cord at any level, the effect on micturition is retention over

cord Histological study of the tumor revealed an angiosarcoma As for the cause of the rapidly spreading lesion, it must be presumed that a thrombosis occurred in the veins of the spinal cord leading from the location of the strand of vessels at the conus, which brought about the softening of the cord In spite of this unhappy result, one must maintain the belief that in such a case a radical operation is in order, but the possibility of such postoperative damage which may not have as yet been experienced must be kept in mind

(EGON RANZI) JOHN MARTIN, M D

MISCELLANEOUS

Taylor, J The Surgical Treatment of Pain *Lancet*, 1938, 235 1151

In this short discussion the author has not tried to cover the treatment of all types of pain, but only that pain which occurs in painful fingers, painful amputation stumps, and in the syndrome of herniation of the nucleus pulposus He illustrates the dictums that when the nerve sheath has been penetrated by a destructive or irritative process the axons will be so affected in their functions that no peripheral measures are likely to be of any use, and

such treatment as chordotomy may be necessary, and that when a nerve sheath is merely compressed from the exterior, local measures such as relief of pressure are likely to be completely adequate Fingers may remain painful after poorly placed incisions for whitlows because the digital nerves may become compressed in scar tissue, or an actual ascending neuritis may result In the one case neurolysis will accomplish the desired results, in the other, section of the nerve well above the painful area may be necessary In the case of a painful amputation stump, or of pain in a phantom limb, local or conservative measures are likely to result in failure, and section of the anterolateral tracts (chordotomy) is favored A ruptured, protruding nucleus pulposus over which the caudal roots ride to produce a now fairly well recognized pain syndrome affords an example of local irritative or pressure effects, the removal of the anatomical cause of these effects completely frees the patient of any pain

Pointing out the fact that peripheral measures rarely relieve pain in the hysterical patient, Taylor advises the pre-operative injection of novocaine as a test of value in the patient whose complaint might possibly be functional rather than organic

JOHN MARTIN, M D

epidural fat should be considered. If the patient is very ill with signs of sepsis and a tender zone or slight enlargement of the spine osteomyelitis of a vertebra should be suspected and immediate surgical intervention carried out. ROBERT ZOLLINGER MD

Voss O. On the Operative Treatment of Blood Vessel Tumors of the Spinal Cord. (Zur opera-tiven Behandlung der Gefäßgeschwülste am Rückenmark) *Beitr. klin. Chir.* 1938 108 219

Blood vessel tumors occur much more rarely in the spinal cord than in the brain. Little is known concerning the results of an operative attack. With this viewpoint the following cases are published one of which presents a diffuse the other a circumscribed blood vessel tumor. The first case has to do with a racemose venous angioma of the type frequently described in the literature. As the basis of the clinical appearances there must occur on the one hand a dilatation of the spinal veins which in the form of a venous coil presses on the spinal cord or on the other hand obviously vascular myelitic changes in the spinal cord unrelated to the former condition. In 1912 Borchard recommended the attempt at ligation and extirpation of these varices. If the angioma is limited only to the spinal meninges extirpation is entirely possible. Dandy has successfully removed two dural angiomata of the cerebrum. However if the vascular changes extend into the substance of the spinal cord the lesion should be let alone.

Two years previously a fifty year-old man began to have sciatic pain with gradual weakness of both legs. Next a spastic paraparesis and finally the picture of a complete transverse lesion with a flaccid paraplegia. Myelography revealed no definite block but after twenty four hours there was a large collection of lipiodol at the level of the sixth and seventh thoracic vertebrae and a collection of lipiodol like a string of beads from the tenth thoracic vertebra downward. A laminectomy under local anesthesia was done from the fifth to the seventh thoracic vertebra. After free exposure of the dura mater a definite arachnoiditis was found which gave free access upward and downward when it was dissected free. Between the fifth and sixth thoracic vertebrae especially on the right side there was a coil of veins as large as the terminal phalanx of a large middle finger. The vein spread out in knotted masses over all the surface of the cord. The patient obviously had a case of racemose venous angioma. There was no pulsation in the angioma. The vein were ligated superiorly inferiorly and at the intervertebral space after a preliminary attempt at cutting off the circulation. A definite reduction of the contents of the angioma had to be accomplished. Further ligation was attempted with the use of clips. On the twelfth postoperative day the patient died of bronchopneumonia. Histological study showed that the angioma not only involved the meninge of the cord but that it had also extended into the cord itself. The varices were to be found

in the pia as well as in the grey substance of the cord. In addition in the upper lumbar cord there was as a result of the interference with its circulation an area of softening which resulted in ascending degeneration of the afferent pathway (posterior columns lateral spino cerebellar pathways).

It is a question then in the light of Borchard's suggestion that if racemose venous angiomata be attacked operatively how much success is promised in view of the operative findings. On the basis of his experience in such cases the author at this point advises the greatest conservatism just as Cushing did regarding cerebral angiomata. Such a wide spread angioma leading first of all before it produces compression symptoms to intramedullary blood vessel disturbances in the spinal cord which produce more or less severe degenerative changes in the cord. Additional cord changes can indeed be produced later by pressure effects of the angioma but these are no longer of decisive importance in furnishing indications for treatment. It would be better not to attack such cases operatively. The author also calls attention to the fact that the operative ligation of the vessels carries with it the danger of damage to the cord which one can largely eliminate by a preliminary observation of the action in the twisted vessel.

The second case has to do with a circumscribed angioma of the spinal meninges which had in places become sarcomatous. The postoperative complications are noteworthy in this case. A forty-five year old man had had from time to time during the last ten years a pain limited to the left leg. Recently there had been paresthesia. His gait became unsteady. He was accepted because the condition slowly became worse. There was a slight personal weakness on the right side. The gait was ataxic. Lumbar puncture produced only a small amount of blood. Soon thereafter paralysis of both legs developed. Myelography showed a block at the second lumbar vertebra. The clinical findings suggested a lesion of the conus cauda with the upper level at the second lumbar vertebra. A laminectomy from the eleventh thoracic to the fifth lumbar vertebra was done under local anesthesia. With the uncovering of the dura there appeared a greenish blue smooth hard tumor which reached from the twelfth thoracic to the fifth lumbar vertebra. Through its center ran somewhat like an umbilical cord a corkscrew like strand of vessels consisting of a deep blue and a smaller reddish vessels which came from the conus medullaris. After the ligation of these vessels the tumor was easily removed. Following this the paraplegia increased. On the sixth postoperative day the lesion at the transverse cord had advanced to the level of the tenth dorsal vertebra on the thirteenth day to the fifth dorsal vertebra. Death occurred on the fifteenth postoperative day with rapidly spreading decubitus lesions and urinary tract infection. Autopsy showed a spreading softening of almost the entire lower half of the spinal

cord Histological study of the tumor revealed an angiosarcoma As for the cause of the rapidly spreading lesion, it must be presumed that a thrombosis occurred in the veins of the spinal cord leading from the location of the strand of vessels at the conus, which brought about the softening of the cord In spite of this unhappy result, one must maintain the belief that in such a case a radical operation is in order, but the possibility of such postoperative damage which may not have as yet been experienced must be kept in mind

(EGON RANZI) JOHN MARTIN, M D

MISCELLANEOUS

Taylor, J The Surgical Treatment of Pain *Lancet*, 1938, 235 1151

In this short discussion the author has not tried to cover the treatment of all types of pain, but only that pain which occurs in painful fingers, painful amputation stumps, and in the syndrome of herniation of the nucleus pulposus He illustrates the dictums that when the nerve sheath has been penetrated by a destructive or irritative process the axons will be so affected in their functions that no peripheral measures are likely to be of any use, and

such treatment as chordotomy may be necessary, and that when a nerve sheath is merely compressed from the exterior, local measures such as relief of pressure are likely to be completely adequate Fingers may remain painful after poorly placed incisions for whitlows because the digital nerves may become compressed in scar tissue, or an actual ascending neuritis may result In the one case neurolysis will accomplish the desired results, in the other, section of the nerve well above the painful area may be necessary In the case of a painful amputation stump, or of pain in a phantom limb, local or conservative measures are likely to result in failure, and section of the anterolateral tracts (chordotomy) is favored A ruptured, protruding nucleus pulposus over which the caudal roots ride to produce a now fairly well recognized pain syndrome affords an example of local irritative or pressure effects, the removal of the anatomical cause of these effects completely frees the patient of any pain

Pointing out the fact that peripheral measures rarely relieve pain in the hysterical patient, Taylor advises the pre-operative injection of novocaine as a test of value in the patient whose complaint might possibly be functional rather than organic

JOHN MARTIN, M D

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out a death. Others agree that the operative mortality is low. Ascoli (2) found the late mortality to be 14.5 per cent in his experience. The Monaldi procedure has been employed by Finochietto (18) and by others as a basis for more extensive thoracoplasties and in combination with extrapleural pneumonolysis.

Since the publication of many of the articles dealing with the Monaldi type of operation there has been a revival of the use of extrapleural pneumothorax. This procedure, which dates back to Tuffier's first operation in 1891, was little used until recently when following the enthusiastic reports of Graf (25) and of Schmidt (55) in representative series of cases it has been widely adopted. It is particularly of value in the type of case considered suitable for Monaldi thoracoplasty and in this country, at least, has probably precluded the use of this type of thoracoplasty. Recent articles by Roberts (53), Belsey (3), and Overholt and Tubbs (48) summarize experiences with extrapleural pneumothorax in this country and in England.

The development of the modern form of thoracoplasty was characterized by a change from widespread collapse of moderate degree to a marked localized collapse. This change to a selective thoracoplasty, aided by wider exposure of the upper ribs secured by division of the anterior serratus muscle, and the increase in the use of multiple small stages, brought about a marked improvement in the results. Alexander (1) believes that the addition of resection of the transverse processes also has been an important factor. His own figures well illustrate the progress accomplished. Among 50 patients operated upon prior to April, 1931, there were 19 deaths (38 per cent mortality). From April, 1931, to January, 1935, there were 156 cases with 20 deaths, (12.8 per cent mortality). The mortality among 178 patients operated upon from 1934 to 1937 had fallen to 6.1 per cent. During the period when he was using the old type of operation there were good results (cavity closure and negative sputum) in 52.1 per cent of the cases, whereas in the group of 119 patients operated upon from 1932 to 1934 there were good results in 83.1 per cent. These results of Alexander are representative of the best obtained from the use of thoracoplasty alone.

It is interesting in this respect to review the results of thoracoplasty as reported from various parts of the world during the last three years. Coryllos (11) in 1936 reported results of 307 operations performed upon 170 patients in New York with arrest of the disease in 71.1 per cent and an average mortality of 13.5 per cent.

Urquhart (69) in 1937 gave his results in 200 consecutive cases among patients varying in age from four to fifty-nine years. Fifty-nine and five-tenths per cent of the cases were apparently arrested and the total mortality for two years was 12.5 per cent. Among 41 patients subjected to partial thoracoplasty 39 were apparently cured, and there were no deaths. Crimm, Short, and Baker (16) at the Boehne Hospital in Indiana carried out thoracoplasties in 100 patients without a single death during the first four months. In 80 per cent of the patients the originally positive sputum (94) became negative within four years after operation. Carter (8), in 1936, reported the late results of thoracoplasties performed by him upon 103 patients from two and one-half to eleven years after operation. Fifty-eight per cent were alive, able to work, practically symptom-free, and had negative sputum. Carter had an early mortality of 8.7 per cent and a late mortality of 17.4 per cent. From abroad the reports of results of thoracoplasty have in general been less satisfactory. Gjessing (23) in Norway found that 45 per cent of the patients who underwent thoracoplasty became able to work and were rendered symptom-free, 75 per cent were benefited. Haugseth (31), reporting from the Marine Hospital in Norway, found that only 11 of their 29 patients were apparently cured. Zandomeni (74) in Milan found clinical healing in 23 per cent of his personal cases within one year after operation, and 56 per cent more benefited. Christenson and Helms (10) in Denmark reported good results in 48.3 per cent of 60 cases treated with thoracoplasty. Rischel (52), also in Denmark, found sputum conversion in 37 per cent of 203 patients.

With the development of the selective type of thoracoplasty it became necessary to locate more exactly the cavities to be collapsed. It was also recognized that certain locations of the cavity made it more readily collapsible. Coryllos and Hochberg (13) studied 150 cases of unilateral caseous pneumonic tuberculosis from the standpoint of the relation of the location of the cavity to the results obtained from attempts to close it by means of the standard type of thoracoplasty. Approximately two-thirds of the cases were found to have cavities in the upper third of the lung field, and in only 3 instances were these not located in the posterior half. Frimann-Dahl (20) in Norway also found a similar location of cavities. In the series reported by Coryllos and Hochberg (13) the cavity was most frequently located in the upper outer zone in 29.3 per cent of the total number of cases, and, as would be expected, the cavities in this area were particularly subject

THORACOPLASTY FOR PULMONARY TUBERCULOSIS

Collective Review

RICHARD H MEADE Jr M D Philadelphia Pennsylvania

THE scope of collapse therapy in the management of pulmonary tuberculosis has steadily been extended in recent years. Among the many reports bearing witness to this are those of Leslie and Anderson (42-43) from the Michigan State Sanatorium and those of Sinding Larsen (64) and Gravesen (27) from the Vejleborg Sanatorium in Denmark. In the Michigan institution 78.5 per cent of the 124 patients admitted from 1930 to 1934 received some form of collapse treatment with sputum conversion in 17.5 per cent and cavity closure in 71.5 per cent. The Danish study covered the period from 1906 to 1932 during which time 126 patients were subjected to some form of collapse treatment. Before the addition of thoracoplasty to the methods employed good results based on the ability to work amounted to 40 per cent whereas afterward the figure rapidly rose to 74 per cent by 1932. Leslie and Anderson conclude from their study that all patients admitted to a sanatorium with the adult type of active pulmonary tuberculosis should receive collapse therapy unless they are in the terminal stages of the disease and the Danish writers agree in principle.

As it is difficult to compare the results of treatment as reported from different clinics or even from the same clinic for different periods of time the study made by Freedlander and Wolpaw (19) is particularly valuable. They studied the comparative results obtained in patients selected for thoracoplasty who accepted or refused the operation. Between the years 1932 and 1934 inclusive 153 patients were selected. Eighty-five accepted the recommendation and 68 refused. The remaining 10 refused at first but accepted after from one to three years. A follow-up study was made on 114 of the 125 surviving patients during the first three months of 1936. Fifty-seven per cent of the group treated by thoracoplasty had become closed cavities while only 10 per cent of the control group so qualified. Fourteen per cent of the patients treated by surgery had died while 6 of the latter had died. A further study of functional results was comparable to studies based upon the classification into good chronics and slipping chronics.

In children thoracoplasty has apparently been little used judging from the few reports in the literature. The general subject of collapse therapy has however been given more attention. Gross (5) in writing on the treatment of the child with the adult form of the disease makes a strong plea for the use of collapse therapy believing that thoracoplasty should be used when other measures fail.

In regard to the use of thoracoplasty aside from the higher risk the problem of later skeletal deformity has been important. Alexander (1) in discussing the subject stated that he considered it should be used as in adults and that the danger of later deformity was less important than the danger incurred from withholding treatment. He quoted the reports of Wiese, Berard and Lardenois, Simon and Kinsella, Urquhart (60) performed successful total thoracoplasties on 2 children of five and four, respectively, for empyema complicating pulmonary tuberculosis. Other recent reports have come from Siegel and Sinner (63) of New York from Blanch *et al* (5) in Uruguay and from Radin (51), Shatalova and Khrushcheva (62) in Russia.

The Monaldi type of thoracoplasty which was introduced in Rome in 1932 and has since been extensively used in Italy and South America has been the subject of many reports within the last few years. This procedure directed at limitation of the respiratory movements in vertical and horizontal planes by paralysis of the diaphragm and resection of anterolateral segments of ribs was originally used only for cases in which pre-mothorax had been unsuccessful and in which the lesion was not fibrous and rigid but with greater experience the indications were extended.

Guglielmelli (9a) in 1937 reported on a critical study of 98 cases with cavities and came to the conclusion that only those cavities surrounded by tissue capable of relaxation were favorably influenced by this type of thoracoplasty. Sixty-five and three tenths per cent of his cases were considered cured. Similar results have been reported by Ascoli (2), LaPossa (41), Finocchio and Aguilar (18), Charnel (9) and Maurer and Rautureau (43). Fatyev (19) reported 230 cases treated at the Forlanini Institute in Rome with

out a death. Others agree that the operative mortality is low. Ascoli (2) found the late mortality to be 14.5 per cent in his experience. The Monaldi procedure has been employed by Finochietto (18) and by others as a basis for more extensive thoracoplasties and in combination with extrapleural pneumonolysis.

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to the collapse produced by the ordinary para vertebral thoracoplasty and closure was accomplished in 95.5 per cent of them. The lower and middle inner zones were the most difficult to collapse.

Usually cavities may be well localized and visualized by the ordinary methods. Certain cases in which there is much pleural thickening or in which there is great pulmonary fibrosis resist these methods. Also in cases in which a positive sputum after thoracoplasty indicates the persistence of an uncollapsed cavity the localization or even the demonstration of the cavity may be extremely difficult or impossible. The introduction recently of a new roentgenographic technique promises to solve these problems. This new procedure, variously called tomography, serioscopy, planigraphy, or body layer roentgenography, allows focussing on the various layers of the body and makes possible the demonstration of cavities not otherwise discernible (Cottentat (15) and Taylor (67)).

When failure to collapse certain upper lobe cavities resulted from the use of the posterior thoracoplasty it became apparent that further resection anteriorly might bring about the desired effect. Haight (30) in 1936, discussed the advantages of this operation and described the removal of the anterior costal segments with hinging of the corresponding cartilages at the sternum. The latter is done instead of resection in order to insure the eventual stability of the chest wall which frequently does not follow resection of the cartilages. Haight urged the performance of the operation after the posterior thoracoplasty rather than preceding it as the lateral chest wall will have become stiffened as a result of the formation of fibrous tissue in the field of the posterior resection and will counteract the tendency toward paradoxical movements of the anterior chest. The use of the anterior stage after the usual posterior one allows one to resect smaller segments at the first operation. This horizontal staging of the thoracoplasty has according to Haight further lowered his mortality rate. Among 50 patients subjected to this combined anterior and posterior thoracoplasty between December 1932 and October 1935 cavity closure and sputum conversion were secured in 46 (92 per cent). There were no deaths and the remaining 4 patients were benefited.

The use of the anterior operation as a preliminary to the posterior has been described by Wangenstein, Carlson and Bowers (71). They believe that the advantage of this sequence is that the operation causes little reaction in the

patient and the posterior operation can be soon and easily performed which makes possible the establishment of maximum collapse with minimum operative reaction. In their experience the resection of the costal cartilages did not result in a flaccid chest wall. Forty-two patients were treated by this method between 1934 and 1936 and within from six months to three years 60 per cent were found to have closed cavities and negative sputum. In 10 of the cases an extrascapular apicolysis was also done.

In Germany Heller (34) has also reported on the use of the preliminary anterior resection in the handling of adherent apical cavities. He follows this stage with a posterior thoracoplasty combined with apicolysis with or without plombage.

In order to improve the collapse obtained by the ordinary posterior thoracoplasty the use of partial resection of the clavicle has been again discussed in the literature. Berard, Dargent and Francillon (4) in a comprehensive survey of the subject came to the conclusion that the procedure might be of value in reoperation by the anterior route for removal of reossified ribs in an attempt at selective collapse of the Monaldi type but as a supplementary operation to the modern posterior thoracoplasty they consider it needless. Pieri (49) in Italy on the other hand found it of real value in 5 cases of apical cavity treated by means of posterior thoracoplasty.

The suggestion of Holman (35) that the lower end of the scapula be resected in cases requiring the removal of less than 7 ribs has been of real value and has been widely adopted. The smaller scapula can fit into the decostalized area and so help maintain the collapse which could not otherwise be accomplished without further rib resection and the sacrifice of normal lung.

Since Head (33) in 1920 first described his muscle splitting operation in performing a thoracoplasty there have been scattered reports in the literature upon the use of it and of similar procedures. He has recently drawn attention to it again believing that it cuts down a great deal upon the shock of the thoracoplasty. He has been able to accomplish a complete thoracoplasty through muscle splitting incisions and has even been able to add extrascapular apicolysis to the procedure. He finds however that he cannot free the attachments of the serratus magnus nor divide the scalene muscle through these incisions and therefore reserves the operation for patients who are poor risks and for those without large cavities. Wangenstein (70) recently has described an operation in which he accomplishes

extensive rib resection through small incisions by means of special instruments, and does not cut across large muscles Iselin (38) in France and Finochietto (18) and Vaccarezza (24) in the Argentine have also described muscle-splitting operations The latter especially emphasize the better skeletal functional results obtained

Believing that the collapse obtained by the most complete form of thoracoplasty did not at times collapse all cavities, various men have advocated the use of extrapleural apicolysis in conjunction with thoracoplasty, which adds a vertical collapse From the time of Friedrich's first use of the procedure in 1908 up to the present, there have been numerous reports upon its efficacy The most recent reports have been made by Holst (36, 37), and by Romanis and Sellors (54) and Head (32) Holst, in 1936, reported on 92 cases with only 2 deaths, but the operations had been done too recently to judge the real value of the procedure Romanis and Sellors, in describing their technique, emphasized the importance of carrying the extrapleural separation well down along the mediastinum They carry out the apicolysis after resecting the third rib and before attacking the upper 2 which can then be more easily resected They usually resect the upper 4 or 5 ribs and small segments of the next lower 2 ribs at the first stage Head (32) used plombage with good results

Semb (56), in 1935, published an account of his operation of extrafascial apicolysis and in subsequent papers has given the results of his experience with it He, as others, had had difficulty in causing closure of certain cavities in spite of the most extensive rib resections The addition of extrapleural apicolysis had allowed for a greater apicocaudal collapse and had caused temporary closure of the cavities, but following the resorption of the fluid in the extrapleural space, re-expansion of the apex had occurred In order to make this collapse permanent, Semb performed an extrafascial separation, he left the soft tissue cap on the apex of the lung, but divided its attachments to the surrounding structures It had long been known that the apex of the lung is suspended by fibrous bands, or strips of fascia, which run to the vertebral column, the fascia about the brachial plexus and subclavian vessels, and to the mediastinum (Sibson's fascia and Zuckerlandl-Sebileau's bands) Division of the intercostal bundles and of the periosteum in their posterior portions allows them to fall in over the mobilized apex when the suspensory bands of the apex have been cut The ribs regenerate in their depressed positions and so prevent re-expansion of the apex

The scalene muscles are divided well above the first rib so that the periosteum is not drawn up by them when the rib is resected

At first Semb used this apicolysis in combination with resection of many ribs in one stage, at times taking as many as 11 ribs It soon became evident, however, that this was too much, and with a reduction in the number of ribs removed at one time, his mortality rate showed a marked drop Among the first 133 cases there were 127 one-stage thoracoplasties, with 10 deaths (7.5 per cent) during the first two months Among 77 apical thoracoplasties with the resection of 6 ribs or less in one stage, there were only 2 deaths (2.5 per cent) At present Semb resects only 3 or 4 ribs at one stage This relationship between the number of ribs removed at one stage and the mortality has long been recognized in this country, and for a number of years the resection of more than 3 ribs at one time has been an unusual procedure Hedblom and Alexander particularly emphasized this point

When one compares the results of thoracoplasty with extrafascial apicolysis with those obtained from the best type of thoracoplasty without lung mobilization in terms of cavity closure and sputum conversion, it is seen that they are almost identical In Semb's (58) last report covering his experience with 149 cases from 1934 to 1937, the early mortality was 3 per cent, and the late mortality, 3 per cent, cavity closure was 87.2 per cent, and sputum conversion 85.1 per cent, or 93 and 91 per cent, respectively, among the surviving patients Alexander (1) and Haight's results in 119 patients treated between 1932 and 1934 showed a total mortality of 10.9 per cent, and cavity closure and sputum conversion in 93.4 per cent of the surviving patients The mortality rate was cut to 4.3 per cent (early deaths) and 2.5 per cent (late deaths) among 146 patients operated upon between 1934 and 1937

Overholt (46, 47) has reported the largest series of cases of lung mobilization with thoracoplasty In his first article published in 1937, dealing mainly with the technique of the operation, he reported successful collapse in 92 per cent of 93 surviving patients, with an operative mortality of 5.6 per cent These results compared favorably with those obtained in 147 patients treated by thoracoplasty without lung mobilization Of the 133 surviving patients in that group, only 71 per cent were considered to have a satisfactory collapse, and the operative mortality was 6.4 per cent In 1938 Overholt presented his results in a series of 232 patients treated by lung mobilization with thoracoplasty and 138 patients

to the collapse produced by the ordinary paravertebral thoracoplasty and closure was accomplished in 95.5 per cent of them. The lower and middle inner zones were the most difficult to collapse.

Usually cavities may be well localized and visualized by the ordinary methods. Certain cases in which there is much pleural thickening or in which there is great pulmonary fibrosis resist these methods. Also in cases in which a positive sputum after thoracoplasty indicates the persistence of an uncollapsed cavity, the localization or even the demonstration of the cavity may be extremely difficult or impossible. The introduction recently of a new roentgenographic technique promises to solve these problems. This new procedure variously called tomography, serioscopy, planigraphy or body layer roentgenography, allows focussing on the various layers of the body and makes possible the demonstration of cavities not otherwise discernible (Cottentat (15) and Taylor (67)).

When failure to collapse certain upper lobe cavities resulted from the use of the posterior thoracoplasty, it became apparent that further resection anteriorly might bring about the desired effect. Haight (30) in 1936 discussed the advantages of this operation and described the removal of the anterior costal segments with hinging of the corresponding cartilages at the sternum. The latter is done instead of resection in order to insure the eventual stability of the chest wall which frequently does not follow resection of the cartilages. Haight urged the performance of the operation after the posterior thoracoplasty rather than preceding it as the lateral chest wall will have become stiffened as a result of the formation of fibrous tissue in the field of the posterior resection and will counteract the tendency toward paradoxical movements of the anterior chest. The use of the anterior stage after the usual posterior one allows one to resect smaller segments at the first operation. This horizontal staging of the thoracoplasty has according to Haight further lowered his mortality rate. Among 50 patients subjected to this combined anterior and posterior thoracoplasty between December 1932 and October 1935, cavity closure and sputum conversion were secured in 46 (92 per cent). There were no deaths and the remaining 4 patients were benefited.

The use of the anterior operation as a preliminary to the posterior has been described by Wangenstein, Carlson and Bowers (71). They believe that the advantage of this sequence is that the operation causes little reaction in the

patient and the posterior operation can be soon and easily performed which makes possible the establishment of maximum collapse with minimum operative reaction. In their experience the resection of the costal cartilages did not result in a flaccid chest wall. Forty-two patients were treated by this method between 1934 and 1936 and within from six months to three years 50 per cent were found to have closed cavities and negative sputum. In 10 of the cases an extrascapular apicolysis was also done.

In Germany, Heller (34) has also reported on the use of the preliminary anterior resection in the handling of adherent apical cavities. He follows this stage with a posterior thoracoplasty combined with apicolysis with or without plombage.

In order to improve the collapse obtained by the ordinary posterior thoracoplasty, the use of partial resection of the clavicle has been again discussed in the literature. Berard, Dargent and Francillon (4) in a comprehensive survey of the subject came to the conclusion that the procedure might be of value in reoperation by the anterior route for removal of reossified ribs in an attempt at selective collapse of the Mondini type, but as a supplementary operation to the modern posterior thoracoplasty they consider it needless. Pien (49) in Italy on the other hand found it of real value in 5 cases of apical cavity treated by means of posterior thoracoplasty.

The suggestion of Holman (32) that the lower end of the scapula be resected in cases requiring the removal of less than 4 ribs has been of real value and has been widely adopted. The smaller scapula can fit into the decontaminated area and so help maintain the collapse which could not otherwise be accomplished without further rib resection and the sacrifice of normal lung.

Since Head (33) in 1929 first described his muscle splitting operation in performing a thoracoplasty, there have been scattered reports in the literature upon the use of it and of similar procedures. He has recently drawn attention to it again, believing that it cuts down a great deal upon the shock of the thoracoplasty. He has been able to accomplish a complete thoracoplasty through muscle splitting incisions and has even been able to add extrascapular apicolysis to the procedure. He finds however that he cannot free the attachments of the serratus magnus nor divide the scalene muscle through these incisions and therefore reserves the operation for patients who are poor risks and for those without large cavities. Wangenstein (70) recently has described an operation in which he accomplishes

cent of these patients, it being either paralyzed, elevated and fixed, or obliterated by fibrosis. The authors believe the incidence can be decreased by attention to the predisposing factors, especially to the ability to raise the sputum, and to decrease of the magnitude of the lung mobilization. Treatment is directed toward evacuation of the obstructed portion of the bronchial tree.

Tuttle, O'Brien, and Graham (68) in a study of 46 patients who were submitted to thoracoplasty, found that those with exudative or mixed lesions and with a high degree of tuberculin sensitivity had many more severe reactions than patients with productive lesions and a high degree of sensitivity.

The patients having the most severe reactions demonstrated a marked loss in this sensitivity. It was believed that the authors' findings supported the hypothesis that the operation produced an autotuberculinization by causing the squeezing out of tuberculin from the collapsed lung tissue. They believe that deaths previously ascribed to myocardial failure have really been due to severe autotuberculinization.

Lilienthal (44) has for years been using a form of extrafascial apicolysis in conjunction with thoracoplasty, in which he packs the extra fascial space with a rubber dam. Recently he has described the same procedure carried out without resection of the first rib. Butler (7) also, in his recent modification of the Semb operation, does not resect the first rib and believes its conservation aids in decreasing the deformity of the chest, and shortens the operative time, without interfering with the effectiveness of the collapse.

The problem of the cavity which resists the usual primary attempts to collapse it, either by a combination of the older types of operation, or by thoracoplasty with lung mobilization, continues to be a difficult one. The reports of success vary from Coryllos' (11) 35 per cent in 48 cases with ordinary revision to Kinsella's (40) 84.6 per cent in 13 cases in which subscapular packing was used, and Semb's (58) 87.5 per cent, using extrafascial apicolysis. Alexander (1) was successful in 78.5 per cent of 14 cases with ordinary methods, as was Semb (58) using extrafascial apicolysis. Gale and Oatway (22), also attempting lung mobilization, succeeded in only 44.4 per cent of 9 cases and had 3 deaths. Welles (73), from his failure in 6 cases and from a study of the results of others, believes that the character of the lung itself is at times the cause of the failure, and as the mortality rate is high, that only in cases in which an obviously inadequate primary operation was done should revisions be attempted.

That the presence of a persisting pneumothorax or pleural effusion interferes with the success of thoracoplasty has been generally thought to be true. These disadvantages are well brought out in the study conducted by Coryllos and Hochberg (14) at Sea View Hospital. The presence of either complicating factor interferes with the falling in of the chest wall, and maximum collapse cannot be obtained. Among a group of 100 patients operated upon between 1931 and 1935 with a persisting pneumothorax and, or, a pleural effusion a successful result was obtained in 76 per cent. In a group of 116 cases operated upon during the same period, in which complete re-expansion of the lung had been accomplished before the thoracoplasty was started, successful results were obtained in 89.5 per cent. The authors point out the importance of confining all pre-existing pneumothoraces or effusions to the least possible volume before the thoracoplasty is begun and of controlling the space during the course of the thoracoplasty. A recent article by Steele, Trenis, and Laboe (66) is of great interest in this connection. These authors observed 12 cases in which there was radiographic evidence of complete or almost complete disappearance of the cavities following re-expansion of the lung unsuccessfully collapsed by pneumothorax. This evidence gives even more support to the belief that thoracoplasty should not be done in the presence of a pneumothorax. Under different circumstances Poix, Dreyfus, and Étienne (50) find that apical thoracoplasty can be well combined with pneumothorax collapse of the lower part of the lung. In cases with apical and basal cavities in which collapse of the lower one can be accomplished by pneumothorax, these authors continue the pneumothorax at low pressure while proceeding with the upper thoracoplasty. In this way they secure collapse of all cavities with the minimum amount of rib resection. Good results were reported in 17 of 23 cases (73 per cent). Empyema occurred in only 1 case and there were no deaths. These authors recommend this combination only when it is important to limit the extent of the thoracoplasty.

Although there are many surgeons who routinely use local anesthesia in the performance of thoracoplasties, notably Semb and Carter, most surgeons prefer general anesthesia. Certain fundamental requirements must be met by the general anesthetic. It must allow of adequate oxygenation, must not irritate the respiratory mucous membrane, and must not interfere with the evacuation of bronchial secretions. According to the experience of many, and as discussed

treated without the mobilization. As many of the cases with lung mobilization were recently completed a true evaluation of the success of the collapse is hard to make. The one definite result that could be determined was the effect on the death rate. During the first three months after operation the rates for the cases with mobilization and without it were 4.7 and 6.5 per cent, respectively. This decrease in the mortality rate was accomplished in spite of the acceptance of a far greater number of poor risk patients than in the past. These cases included many patients with bilateral cavities and patients with actively progressing disease. This improvement in the mortality rate is attributed by Overholt and others to the ability of the surgeon to secure maximum collapse of the diseased lung with maximum salvage of the normal lung and of the chest wall. The extension of the indications for thoracoplasty has also been made possible by these considerations. Gale and Oatway (22) reported that they had been operating upon patients who were increasingly poorer risks and that in the five months before the publication of their last report they had not operated upon any patient that would belong to the 'good risk' class. In their series of 102 cases they report complete success in 63 per cent with a total mortality up to two years of 15.6 per cent. They believe that extrapleural apicolysis should not be used routinely and in reviewing their cases now consider that this procedure should have been used in 80 per cent with the complete mobilization of the apex in only half of these. They consider the operation of real value but do not believe it should be used indiscriminately.

Semb used no method to prevent the rise of the mobilized apex before it became fixed by the regenerated ribs. Other surgeons have been concerned with this problem when using the Semb procedure. Romanis and Sellors (54) in 1936 in describing their use of extrapleural apicolysis in conjunction with thoracoplasty said that in some cases they had divided the intercostal bundles and periosteum posteriorly and had then sutured them down over the apex to the tissues about the neck of the next lowest intact rib. Gale and Midelfart (21) have since then described their experiences with a similar method differing in that they also suture the surface of the mobilized apex to the muscle-periosteal flaps. These authors were able to demonstrate the postoperative rise of the mobilized apex during the first four weeks for a distance of one or two inter-spaces before they adopted their technique to prevent it. Wangenstein (70) has used bands of

catgut to achieve the same purpose and Butler (1) has employed the pectoral muscles. Overholt (46) who has reported on his extensive experience has been content to fill the extrapleural space with salt solution at the time of the operation.

Graf (6), Butler (7) and Wangenstein (70) have carried out their extrapleural apicolysis through anterior approaches. Butler does so only when using the muscle pedicle operation and this he limits to patients in very good condition. Wangenstein on the other hand routinely employs the anterior approach and believes that it simplifies the procedure. He resects the upper 3 cartilages and anterior portions of the corresponding ribs. Subsequent stages are of course carried out posteriorly.

In order to combat paradoxical movements of the chest wall and also to secure the maximum amount of collapse Gale and Oatway (22) and Overholt (46) report the routine use of plastic weights after operation and the former also employ spring braces and a padded harness until rib regeneration has taken place. The use of posture to combat the tendency to develop scoliosis after thoracoplasty has become general practice since Bisgard's study in 1933 and the wedging produced by the patient's lying over a bolster or stiff pillow has proved of definite value.

Drainage of the wound was at first used by Semb (56) but he and others have come to the conclusion that this added to the danger of infection and they have abandoned its use. Gale and Midelfart (21) compared the incidence of infection in two series of cases one with drainage and one without and found infection to occur three times more frequently in the drained cases.

The management of the extrapleural space at the time of the second stage operation has been the subject of some discussion. Semb did not disturb this space unless he felt the necessity of extension of the pneumonolysis at that time. Overholt (46) on the other hand has stressed the importance of the reopening of this space and division of the bridge of tissue which seals it off. He believes that this is necessary to insure a more effective collapse. Gale and Midelfart (21) consider the routine reopening of this space as unnecessary.

Of the complications following apicolytic thoracoplasty Gale and Oatway (22) found atelectasis to be the most common. Semb (56) had pointed out that this was an important complication and that it occurred more frequently in patients with paralyzed diaphragms and following extensive rib resection. In the former authors series of 10 cases this complication occurred in 19 per cent. An abnormal diaphragm was present in 90 per

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Wanke, R. Newer Aspects of Chronic Mastopathy
(Die Mastopathia chronica in neuerer Betrachtung)
Deutsche Ztschr f Chir, 1938, 250 234

Mastopathia chronica is not a premature physiological involutory condition of the mammary gland, but is a pathological process, the etiology of which will apparently be cleared up with further study. Statistics show that unmarried women are not affected with mastopathia chronica in greater proportion than the married women, consequently functional disuse of the gland as a cause of the disease is unlikely. Neither apparently is excessive demand on the organ due to repeated pregnancies and lactations to be regarded as a cause, since women who have gone through numerous pregnancies make up a very small part of the material studied. The fecundity of women with mastopathy is on the average only slightly lower than the general average as a whole. Previous studies do not reveal anything of practical importance in the matter of prognosis as to the fecundity of a woman suffering from mastopathy, although it is perfectly evident from the studies of the author that women with mastopathy exhibit, from the thirtieth year of age on, a marked diminution in the number of births, and sometimes complete sterility, however, in this connection there are numerous sources of statistical error.

Qualitative studies on the excretion of follicular hormone in the urine showed in two instances a striking diminution with inversion of the normal curve in the graph, consequently a definite disturbance in the metabolism of the follicular hormone. Frequently there were present at the same time indications of a disturbance of function of the sympathetic system (hypoplasia) of the internal genitalia. On the other hand, the simultaneous development of glandular-cystic hyperplasia of the endometrium has not been noted, this is of significance, insofar as this condition has also been ascribed to a disturbance of the metabolism of the follicular hormone, caused by overproduction of this hormone. It is probable from the standpoint of hormones, that glandular-cystic hyperplasia (formerly metropathia chronica) presents conditions of an exactly opposite character from those found in mastopathia chronica, in the sense that the trouble in the mammary gland is induced by a diminished production of follicular hormone, either from faulty and regionally unequal proliferation, or from undue regressive processes resulting from a relative predominating of the action of the other hormones.

The treatment of mastopathia chronica is dependent primarily upon a differential diagnosis which clarifies the local findings. To this end there is frequently necessitated a biopsy with histological

examination. When the diagnosis is definite, the danger of subsequent development of carcinoma is slight, proper treatment being the administration of follicular hormone, which may be considered as substitution as well as stimulation-therapy. The author has frequently procured good results with follicular hormone. Mastopathia chronica develops in all likelihood on the basis of an ovarian insufficiency.
(TOBLER) JOHN W BRENNAN, M D

Gordon-Taylor, G. Cancer of the Breast *Brit M J*, 1938, 2 1071

The author performed the radical operation for carcinoma of the breast in 603 cases, from 1908 to 1938, inclusive. From 1908 to 1928, he operated upon 363 patients. Of these 113 were classified as belonging to Group 1 and 84.07 per cent survived ten years or more. Two hundred and four belonged to Group 2 and 29.4 per cent survived ten years or more. Forty-six belonged to Group 3 and 6.5 per cent survived ten years or more.

From 1908 to 1933, 497 patients were operated upon. Of these, 163 were classified as belonging to Group 1 and 85.88 per cent survived five years or more. Two hundred and eighty-three belonged to Group 2 and 39.9 per cent survived five years or more. Fifty-one belonged to Group 3 and 9.8 per cent survived five years or more.

From 1908 to 1935, 551 patients were operated upon. Of these 172 were classified as belonging to Group 1 and 85.4 per cent survived three years or more. Three hundred and twenty belonged to Group 2 and 46.8 per cent survived three years or more. Fifty-nine belonged to Group 3 and 10.1 per cent survived three years or more.

Of 158 patients who survived radical mastectomy ten years or more, 8 survived twenty-five years, 6 survived between twenty and twenty-five years, 33 have lived between fifteen and twenty years, and 111 lived for ten years.

Among the 603 cases subjected to operation, there were 8 operative deaths, 1 of hemorrhage, 1 of mesenteric thrombosis, 1 of erysipelas, 1 of wound infection, 1 of cardiac failure, 1 of bronchopneumonia, 1 of pontine hemorrhage, and 1 of "exhaustion" at the termination of operation. The last patient had severe diabetes which was not treated with insulin because insulin medication was unknown at that time.
ARTHUR S W TOUROFF, M D

TRACHEA, LUNGS, AND PLEURA

Neil, J. H., Gilmour, W., Gwynne, F. J., Main, W., and Fairclough, W. A. The Anatomy of the Bronchial Tree and Its Clinical Application
Australian & New Zealand J Surg, 1938, 8 118

In the past, difficulty has been experienced by anatomists in describing the bronchial branches in

by Waters (7) Eversole (17) and Overholt and others cyclopropane most nearly meets these requirements. Water has drawn attention to the desirability of keeping the oxygen content of the anesthetic mixture is similar to that of the room as possible so that following the cessation of the anesthetic the patient will not suffer from a difference in oxygen consumption. The use of the carbon dioxide absorption technique is of real value as it allows the patient to breathe an atmosphere which is warm and moist.

Coryllos and Bass (12) have found intravenous evipal anesthesia satisfactory in a large series of cases. However as the duration of its effects is short it would not be satisfactory for general use particularly when the thoracoplasty is combined with a difficult apicolysis.

Spinal anesthesia has again been described as a useful form of anesthesia for thoracoplasty. Gurd Vineberg and Bourne (29) report the use of nupercaine in 17 thoracoplasties of which 5 were upper stage procedures. They found the operation to be easier with less bleeding and better relaxation and they noted no ill effects.

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incomplete closure cannot produce any marked and permanent changes in the cavity

The authors failed to demonstrate mixed infections in these giant tuberculous cavities and they believe that they have disproved the contention that pyogenic organisms are always present with tubercle bacilli

In the management of giant tuberculous cavities, the authors believe that pneumothorax and thoracoplasty should first be employed as a number of these cavities close following such procedures. They did not obtain satisfactory results from crushing or removal of the phrenic nerve. Closed pneumonolysis produced closure in some cases, in other cases the cavity increased in size. Thoracoplasty with apicolysis, whenever possible, has been used to better advantage than thoracoplasty alone, and this is still the method of choice in cases in which it is possible to use it

In view of the unsatisfactory results from the above procedures, the authors have attempted to obliterate the bronchial opening by injecting sclerosing solutions, blood, and agar into the cavity but without satisfactory results. Direct touching of the bronchial opening, through the cavernoscope, with silver nitrate or cautery also failed to close the bronchus. Intracavity transplantation of the pedunculated muscle flaps, which is dangerous, was given a trial, it gave a 50 per cent negative sputum

EARL O LATIMER, M D

Iselin, M., and Dubau, R. *The Technique of Total Extrafascial Apicolysis* (Technique de l'apicolyse extra-fasciale totale) *J de chir*, 1938, 52 748

The operation that Iselin and Dubau designate as total apicolysis consists in lowering of the upper lobe of the lung in a one-stage operation to the level of the sixth rib. It involves (1) freeing of the apex from the thorax by resection of the first 5 ribs, the length of the rib resection decreasing progressively from the first rib, which is resected almost completely, to the fifth rib, of which only the posterior portion is resected, (2) extra-fascial liberation of the lung by Semb's method, which liberates the apex from the spine and the mediastinum. This method of operation permits the upper lobe to retract vertically, the regeneration of the periosteum maintains the lung in the position of collapse. The incision employed does not cause any deformity

While the authors prefer regional anesthesia with blocking of the intercostal nerves and premedication with scopolamine-morphine-ephedrin, general anesthesia may be employed if the patient does not tolerate the local anesthesia well. The patient is always in ventral decubitus and the incision is made in the back, along the inner border of the scapula. Exposure of the ribs is made without cutting of the muscles for the most part, but the vertical fibers of the trapezius muscle are sectioned near the point of insertion in the scapula. The resection of the ribs is not done to collapse the lung, as in the usual type of thoracoplasty, but to give free access to the apex

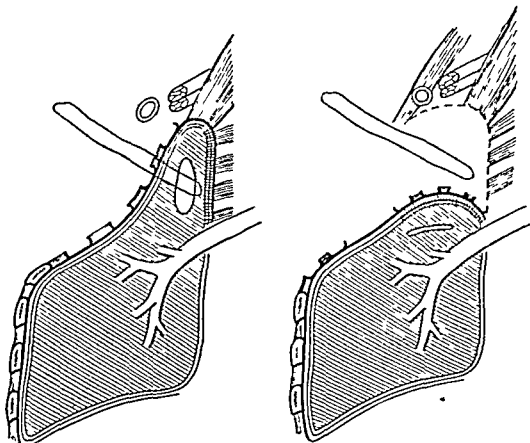


Fig 1 *Left*, Mobilization of lung obtained by partial upper thoracoplasty. The displacement is entirely transverse, the apex of the lung attached to the spine prevents collapse in the vertical axis. *Right*, Mobilization of lung obtained by extrafascial apicolysis (Semb). All the adhesions of the apex to the spine have been sectioned outside the endothoracic fascia, the apex of the lung collapses vertically, it is covered by the endothoracic fascia and the periosteum of the ribs, which regenerate and prevent any re-expansion

and upper lobe of the lung. As noted previously, the first rib is almost completely removed, while only about 5 cm of the fifth rib is resected. After exposure of the lung, the apicolysis is carried out by the use of special instruments, one straight and one partly curved separator to pass underneath the adhesions, and two Mayo scissors, one straight and one curved. The procedure is carried out from the more

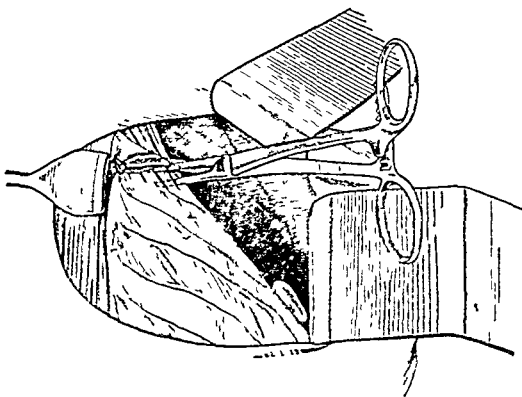


Fig 2 Stage of apicolysis liberation of the apex. The back of the separator, resting on the lower root of the brachial plexus, passes underneath the adhesions, which are isolated, ligated, and sectioned. When the nerve is freed, the same procedure is carried out at a lower level, following the artery

terms of comparative anatomy The tertiary bronchi have an apparent inconstancy which makes it necessary to fall back on the terms dorsal lateral and ventral These terms are frequently used in the textbooks

In the human being some of the tertiary bronchi individualize themselves to form a characteristic bronchial tree while others found in more primitive types of lungs disappear The terms dorsal lateral and ventral used in human anatomy are more or less meaningless as far as ultimate distribution is concerned The inconstancy of the bronchi prevents precision in their description

In all of the lungs which the authors examined (apart from one in which the right upper lobe came from the trachea as in some herbivora) their findings for what they term in the text as consonants have been almost 100 per cent constant The subapicals were the variants

The technique which these authors used was the introduction of fusible metal in autopsy specimens of human and other mammals and dissection and inflation of the specimens examination of the lung *in vivo* by bronchoscopy and the injection of lipiodol into the individual segments separately They used Wood's fusible metal which is composed of 1 part tin 1 part cadmium 2 parts lead and 4 parts bisulphur They also made use of the dissection and inflation method of Mooltan in fresh autopsy specimens

The results of their investigations showed that the upper lobe bronchus divides constantly into 4 tertiary bronchi supplying the apical paravertebral anterior and axillary segments The paravertebral bronchopulmonary segment the bronchus of which is the first to separate from the dorsal aspect of the vestibule is much larger than has hitherto been recorded The middle lobe is served by a bronchus which constantly divides into an anterior and an axillary branch

Variations occur also in the bronchi of the lower lobe The apical bronchus of the lower lobe is constantly present it supplies a separate or partially separate lobe The mesial or infracardiac bronchus and the anterolateral bronchus are also constantly present but the latter may have two openings (1) the anterior cephalad and (2) the lateral caudad The bronchial tree ends by dividing into two terminal bronchi the inner or mesial paravertebral and the outer or lateral posterolateral The new finding is that in varying positions between the apical branch above and the terminal branching below there are 1 or 2 bronchi which have apparently escaped notice by all anatomists surgeons and pathologists

In the clinical application of bronchography the identification of a bronchus is of greatest importance as the orifice of a diseased segment generally shows indications of disease Experiments on dogs have shown that isotonic solutions may be instilled into the bronchi up to the amount of 6 liters without apparently causing harmful changes in the general body conditions or subsequent serious microscopic

lesions in the lungs The fluid is not returned by the trachea A Murphy drip is used at the rate of 1 drop in two seconds Some of the more potent antiseptics now in common use have been introduced in therapeutic doses they are apparently innocuous to the kidneys
J DANIEL WILLEMS M D

Coryllos P N and Ornstein G G Giant Tuberculous Cavities of the Lung *J Thorac Surg* 1938 8 10

The authors place giant tuberculous cavities of the lung into two classes those containing air under positive pressure and those containing air under atmospheric pressure

Cavities containing air under positive pressure (tension cavities) are always spherical and correspond to the variety known as ballooning or ball valve cavities Their walls are thin the sputum is often negative and the general condition of the patient is rather good Fluid is often present in the cavities and lipiodol and dyes when injected into them remain for a variable time but are finally expectorated Such cavities may disappear spontaneously and permanently or may disappear and reappear

Cavities with pressure equal to the atmospheric pressure do not disappear spontaneously and do not contain fluid Lipiodol and dyes when injected are rapidly expectorated These cavities have thick walls and cause a persistently positive sputum They present unyielding resistance to collapse therapy

As the cavities change from one type to the other they take on the characteristics of the new type In the last analysis all giant tuberculous cavities are open cavities regardless of which of the above types they fall into

The authors have examined the cavities in the living patient by introducing a cavernoscope into them through the chest wall At the same time the pressure in the cavity was measured and air was removed for gas analysis The authors were able to visualize the orifice of the draining bronchus in all cavities with pressure equal to the atmospheric pressure As a rule in large cavities with thick wall only one bronchial outlet was present or one was found to be much larger than the others In the upper lobe cavities (the only ones visualized so far) the outlet was dependently located Increase of the pressure in the cavity closed the bronchus and decreased its opening it Even in ten per cent of cavities in which no bronchial outlet could be identified aspiration caused bubbling They are therefore not really closed cavities

The authors believe that giant cavities which do not close under pneumothorax treatment will close following thoracoplasty because the latter causes permanent collapse of the lung and atelectasis The atelectatic lung develops a permanent ischemia with rapid proliferation of the connective tissue

Closed cavities develop a negative pressure which is due to absorption of their contained gases and the cavities shrink or disappear but intermittent and

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Larghero Ybarz, P. Suppurative Adenitis of the Mesentery (Adenitis supuradas del mesenterio) *An Fac de med, Univ de Montevideo*, 1938, 23 531

Ybarz states that micro-organisms and their toxins may reach the mesenteric lymphatic system by chiefly three routes (1) by way of the blood stream, (2) by way of the general lymphatic circulation, and (3) by the extension of regional lesions involving the intestine and its serosa

After having discussed the anatomical make-up and interrelationships of the mesenteric lymph glands, the author describes the various anatomicopathological features of this condition. He distinguishes five principal types of lesions as follows

- 1 Solitary, single, enlarged lymph glands ranging from the size of a nut to that of a hen's egg. The mass is usually fluctuating and contains, as a rule, fluid pus

- 2 Multiple lymph glands which appear enlarged and edematous. Usually one of them is the seat of abscess formation

- 3 Multiple involvement of the lymph glands showing confluence. The suppuration of this mass usually gives rise to multiple abscess formation

- 4 Multiple involvement of solitary lymph glands which present merely a hypertrophy, but which on sectioning are found to contain multiple micro-abscesses

- 5 Lesions bearing grossly a striking resemblance to neoplastic formations

Suppuration of the mesenteric lymph glands may lead to the following processes and complications

- 1 Cyst formation with subsequent absorption, which may be so complete as to leave little or no trace of the original lesion

- 2 Formation of a tumor-like mass situated usually in the ileocolic recess or at the root of the mesentery. This lesion may be so small as to escape detection during clinical, surgical, or post-mortem examination

- 3 Purulent or fibrinopurulent peritonitis of various degrees of severity determined by the rupture of an intralymphatic abscess or by the propagation of an adjacent suppurative process

- 4 Intestinal occlusion determined either by pressure or by the formation of adhesions

- 5 Localized peritonitis

- 6 Massive invasion of the entire mesenteric lymphatic gland system

- 7 Extension into the liver with the formation of multiple hepatic abscesses

- 8 Suppurative peradenitis followed by an infiltration of the mesentery or meso-appendix. In these cases the mesentery becomes markedly thickened

- 9 Subphrenic abscess

The factors leading to this condition may be briefly subdivided into the following groups (1) jejuno-ileal lesions, (2) lesions of the vermiform process, (3) lesions of the cecum, and (4) blood-stream infections

Ybarz presents a series of case reports which illustrate these various factors. He stresses the fact that of all the intestinal lesions, acute appendicitis is most apt to produce suppurative changes in the mesenteric lymph-gland system

The diagnosis cannot be made clinically, and the condition is detected usually during surgical intervention. In some cases the resulting complications, such as hepatic abscess and subphrenic abscess, clearly indicate the presence of an underlying suppurative process of the mesenteric lymph glands

Treatment consists essentially in removal of the underlying cause and raising of the natural defense mechanism of the body. In the presence of such a condition, the author advises drainage, especially in cases of threatening peritonitis, and a low ileostomy in cases of an intestinal occlusion

RICHARD E. SOMMA, M.D.

GASTRO-INTESTINAL TRACT

Nørgaard, F. Peptic Ulcer of the Esophagus *Acta radiol*, 1938, 19 458

After presenting a brief protocol on a girl who had been studied for five years before a definite diagnosis of peptic ulcer of the esophagus was made, Nørgaard discusses the subject, reviews the literature, and suggests methods for better diagnosis

When his patient was first seen she was three years old, and a diagnosis of esophageal spasm, possibly functional, was made. Four years later she was again hospitalized for copious vomiting, hematemesis, melena, and severe pain. An x-ray study again showed spasm and dilatation of the esophagus, which varied in appearance. This was taken as conclusive evidence that the condition was not cicatricial. A year later she was again studied and at this time a definite ulcer niche was found. The diagnosis of peptic ulcer of the esophagus was then confirmed by esophagoscopy

According to the literature, the incidence of occurrence of peptic ulcer of the esophagus varies. Stuart and Hartfall found only 1 case in 10,000 autopsies, Gruber found 6 in 2,400 autopsies. When Jackson studied 4,000 patients with affections of the esophagus, he found 88 cases of peptic ulcer, 21 of which were active

The symptoms in advanced cases are usually pain behind the sternum or in the back. This may occur after meals, or perhaps after the principal meal, with hematemesis, melena, dysphagia, and vomiting. However, very often none of the symptoms is suggestive of esophageal pathology. Obstruction rarely

accessible (posterior) to the deeper (anterior) structures. When the apicolysis is complete the apex of the lung at the level of the 11th rib and leaves a free space above it about the size of a fist. The authors fill this cavity with warm physiological saline solution with acriflavine added to remove the air and supply a layer of fluid which aids in compression of the lung from above downward. The rhomboideus muscle which has been bluntly dissected is closed with a few catgut sutures, the trapezius muscle when sectioned is sutured with great care and the skin is sutured by the Blair Donati method.

The operation causes considerable shock which must be combated by intravenous or subcutaneous saline solution, cardiac stimulants and adrenalin if the blood pressure remains low. The patient may be placed for twenty-four hours in the oxygen tent with the oxygen at about 50 per cent concentration. Patients usually do not complain of much post-operative pain and very little morphine is required. Cough and expectoration subside for the first few days but the cough may become worse after the first week; it is best to control it with morphine for a few days. The expectoration diminishes progressively. In some cases expectoration ceases after the tenth day, in others only after from three to five weeks. Most patients can be discharged by the 16th day.

ALICE M. MEYERS

Cookson H. A. and Mason G. A. *Bronchiectasis a Fatal Disease*. *Edinburgh M. J.* 1938 45 844

Bronchiectasis is a disease which kills its victims with much greater frequency than is usually suspected and many more persons are lost than the records would indicate. Deaths which are due to bronchiectasis are often included under the heading of chronic bronchitis. Deaths may occur with alarming rapidity both in diagnosed and undiagnosed cases of bronchiectasis.

Improvements in surgical technique have made it possible to eradicate the disease in a certain num-

ber of cases and the authors report a series of 17 cases in each of which an entire lung has been removed. Only 5 of the patients died as a result of the operation; however, this procedure is considerably safer in children than in adults.

Bronchiectasis can exist and still not give rise to any symptoms drawing attention to its presence. Improved diagnostic methods have made it easier to detect bronchiectasis. They have also brought out the fact that certain cases are characterized by remissions and exacerbations of symptoms. The better the general condition of the patient and the less the amount of foulness of the sputum, the more favorable is the operative prognosis.

A number of fatal cases of bronchiectasis are found to have been associated with complications. Infection occurring in bronchiectasis cavities may be so severe that the patient eventually dies from a prolonged and profound toxemia.

Inflammatory flare-ups may take place and determine the development of an abscess or even of gangrene in the lung tissue. These are very common terminations of bronchiectasis and their imminence cannot be foretold nor foreseen.

If a pneumonectomy for bronchiectasis is carried out in two stages, the upper lobe being removed some time after removal of the lower lobe, improvement in the condition of the patient may occur after removal of the lower lobe alone. In such a case it is tempting to refrain from completing the pneumonectomy. Experience shows, however, that a relapse is almost certain to occur.

Many cases date back to childhood and there is reasonable expectation of eradication of the disease with an operative mortality which if one considers the nature of the condition is very small indeed. Complete abstention, including modern roentgenological methods, is strongly urged in the cases of children who are found to be suffering from recurrent attacks of chronic bronchitis.

J. DANIEL WELLMAN, M.D.

Heinanen, N The Results of Medical Therapy in Ulcer Disease (Ueber die Ergebnisse der internen Behandlung der Ulkuserkrankheit) *Acta Soc med Fennicae Duodecim*, 1938, Ser B, 25, Fasc 1

This monograph was prepared in order to evaluate the results obtained from the medical treatment of patients with ulcer admitted from 1928 to 1936 to the Second Medical Clinic of the University of Helsinki. In addition, data was reviewed to determine what factors affect the prognosis and favor recurrences in these patients.

There was a total of 423 patients, of which 205 had gastric lesions, 172 duodenal, and 46 postoperative lesions. The x-ray diagnosis was positive in 93.4 per cent and hemorrhage occurred either before or during the hospitalization in 47.3 per cent.

The treatment consisted of Lenzhartz diet, bed rest, and alkalies when needed. The patients averaged thirty days of hospitalization for gastric lesions, twenty-seven days for duodenal lesions, and thirty-one days for postoperative lesions. It was necessary to operate upon 36 patients with gastric and 26 with duodenal ulcer, or about 17 per cent. Surgical therapy produced complete cure in 33 of these patients. The most common indications for surgery were persistence of pain, pyloric or duodenal obstruction, perforation, and absence of roentgenological evidence of improvement.

Of the medically treated patients 5 died while in the clinic, 1 from perforation, 1 from hemorrhage, and 3 from heart failure. Good results were obtained from medical therapy in 75.9 per cent of all the patients admitted.

The postoperative evaluation was based on a minimum observation period of two and one-half years and late results were obtained in 95.7 per cent of all the patients. The final study showed good results in 48.6 per cent of the entire material. Of real interest was the fact that 83 per cent of the relapses occurred within the first year after hospitalization.

The author concludes the prognosis is unfavorable in patients who first develop symptoms when young, as well as in those having symptoms of long duration. In his material the least favorable results were obtained in gastric lesions. Other factors such as sex, heredity, predisposition, occurrence of hemorrhage, gain or loss of body weight, during the course of treatment proved of no significance in the prognosis.

There is included an excellent bibliography and an interesting introduction describing the history of gastroduodenal ulcerative disease beginning with the reports of Hippocrates down to varied treatments and opinions presented in the last few years.

SAMUEL J. FOCFELSON, M.D.

Aird, I The Behavior of the Blood Volume in Intestinal Obstruction and Strangulation *Brit J Surg*, 1938, 26, 418

The author mentions the mechanisms responsible for the loss of circulating fluid in all forms of ob-

struction of the bowel, such as congestion of the capillaries, edema and increased content of the bowel lumen, and failure of absorption of fluids and electrolytes. He then reviews previous reports of measurements of the blood volume, both direct and indirect. A modification of the Brown and Rountree method with vital red dye was used in repeated determinations on a series of 19 dogs to determine their normal blood volume. In 6 of these dogs an occlusion high up in the small bowel was produced and repeated determinations of the blood, plasma, and cell volumes were made. There was first little alteration in the blood volume, but before death a reduction of from 14 to 44 per cent occurred. The cells suffered only a slight loss.

In 4 dogs a low ileal obstruction was produced. Two showed a marked loss in both plasma and cell volume, while the other 2 showed little change.

In 9 dogs venous strangulation was produced by the ligation of all veins draining a loop of bowel. The duration of life varied inversely as the length of bowel strangulated. The reduction in blood volume which followed venous strangulation of the whole small bowel amounted to approximately one-half of the total blood volume, the cells being affected slightly more than the plasma. Obstruction of from one-third to one-fifth of the small bowel showed a loss of from 30 to 50 per cent of the blood volume, affecting chiefly the cell volume. The smaller amounts of bowel were strangulated with little alteration of the blood volume, this slight alteration being confined chiefly to the plasma.

The author believes that dehydration accounts for the loss of plasma volume in high obstructions of the small intestine and this together with demineralization is the cause of death. Low obstruction of the small bowel is believed to produce death through other factors unless the animal lives long enough for dilatation and congestion of the bowel to occur, in which case the blood volume may be reduced, but not sufficiently to cause death. Death from strangulation of one-fifth or more of the small bowel probably occurs because of the blood loss since the loss amounts to approximately 50 per cent and equals the values known to produce death in external hemorrhage.

THOMAS C. DOUGLASS, M.D.

Simpson-Smith, A Sarcoma of the Intestine in Children *Brit J Surg* 1938, 26, 429

Following one case of proved sarcoma of the intestine in a child three years and eleven months old and another case in which the diagnosis appeared to be the same, the author conducted an exhaustive survey of the literature in which more than 100 articles, some extending as far back as 1852, were reviewed. The results of this survey have been carefully tabulated with regard to frequency, age incidence, sex incidence, clinical picture, duration of symptoms, sites of the lesions, type of operation performed, type and number of microscopical reports rendered, sites of metastases, and end-results. In all, reports of 106 cases were made.

occurs in the early stages of the disease. Roentgenographic examination is frequently negative unless definite pain and a niche are present to absolutely prove the diagnosis to the observer who remembers to consider this possibility.

The prognosis is decidedly unfavorable unless the condition is recognized and treated because many cases terminate lethally from perforation of large vessel or adjacent organs. Thorough inspection should be instituted in all patients showing symptoms referable to the esophagus. This should be done even though the customary x-ray examination proves negative. It is also probable that if we follow Jackson's example and examine thoroughly all patients with pronounced gastric symptoms and hematemesis and no abnormal findings in the stomach or duodenum it would be possible to demonstrate roentgenologically a peptic ulcer of the esophagus just as Jackson has done by direct esophagoscopy. SAMUEL J. FOGELSON, M.D.

Engels H. A Study of the Lymphatic System of the Stomach and Upper Duodenum and Its Relationship to Peptic Ulcer. (Untersuchungen ueber den lymphatischen Apparat des Magens und des vorderen Duodenums hinsichtlich seiner Beziehung zum Ulcus pepticum). *Arch f. klin. Chir.* 1938 192 94.

In 60 specimens obtained by resection of the stomach there were consistently found marked changes of the lymphatic tissues in the walls of both the stomach and duodenum even where they were not involved by the ulcer itself. Not only are there considerably more lymph nodes in the submucosa than normal but they are also swollen. Immediately adjacent to these nodes lymphatic tissue was found under and between the mucous membrane structures so that in many places the epithelium seemed to be pushed away from the underlying structures. This leads to lasting impairment of the mucous membrane no treatment which as well as the attenuation due to pure mechanical pressure leads to weakness of the mucous membrane. In these areas there is either a superficial or a deep tissue loss which resembles early ulcer to a great extent. The entire picture suggests a primary pathological process in the lymphatic tissue of the walls of the stomach and duodenum very similar in type to that seen in tonsillar angina or appendicitis. The ulcer formation may therefore be considered a second disease following the primary process occurring below the mucous membrane. This leads not only to superficial tissue destruction but also to impairment of healing. One often observes at the edge of ulcers the futile tendency on the part of the mucosa to cover the defect. (RICE) SAMUEL J. FOGELSON, M.D.

Miller T. C. and Elsom A. A. The Management of Massive Hemorrhage from Peptic Ulcer. *Med. Clin. North Am.* 1938 21 11.

The authors present an analysis of their studies of 63 personal cases of massive hemorrhage from

peptic ulcer. The data were subdivided into the following groups:

Group A. Data pertaining to 5 patients in whom hemorrhage could not be controlled medically and in whom surgical intervention was undertaken as a life saving procedure.

Group B. Data pertaining to 14 patients who were operated upon after the hemorrhage had ceased.

Group C. Data pertaining to all of the patients including 49 who had received only medical treatment at the time of the hemorrhage or very soon afterward.

The chief purpose of the analysis was to determine the form of treatment best suited to any particular patient with a bleeding ulcer.

The mortality in the first group of 5 patients was 100 per cent. One death occurred as a result of pulmonary complications, 1 was due to thyroid crisis, 2 were due to gastric lesions in which the surgical lesion could not be managed and 1 occurred because of failure to discover the causative lesion. In 3 of the patients autopsy showed a large eroded vessel which precluded recovery except by surgery. (It was of interest to note that 2 of these patients were in the third decade of life while the other was in the fourth decade.)

All but 1 of the 14 patients in the second group (operated upon after the hemorrhage had ceased) survived and subsequently were discharged in a satisfactory condition. Autopsy in the fatal case revealed no satisfactory explanation for death. The medical management of these patients prior to operation was very conservative. They were given nothing by mouth for forty-eight hours or more, morphine was given hypodermically and they were fed eventually the Anderson gelatin mixture of the Sippy milk and cream combination.

Among the 49 patients who were not operated upon there were 3 deaths, 1 of which was secondary to perforation, the other 2 were due to continued profuse hemorrhage.

Altogether there was a total of 9 deaths in the entire group of 68 patients admitted to the hospital for acute massive hemorrhage from a peptic lesion. A critical analysis of all the cases failed to reveal any helpful procedure for determination of either the progress of the bleeding or its cessation. The opinion of the authors is that at least 90 per cent of the patients can be treated for the hemorrhage on a medical regimen and that management of the remaining 10 per cent represents a serious problem. The only hope of reducing this mortality is early recognition of the specific cases which belong to the group in which hemorrhage continues until the patient dies or until a blood vessel is ligated. However, the authors state that since a study of the data presented leaves them without clear cut indications for immediate surgery, their decision must be based on rather ill advised and intangible clinical judgment, the limitation of which are quite apparent from the mortality statistics.

SAMUEL J. FOGELSON, M.D.

vincing It is suggested that an emotional upset is the most important factor in the cause Methods of treatment are described Meticulous care of each patient with an optimistic attitude on the part of both the patient and the physician is a factor most essential in any form of treatment

JOHN W NUZZUM, M D

Wittkower, E Ulcerative Colitis Personality Studies *Brit M J*, 1938, 2 1356

The author has investigated the relative significance of physical and personality factors in the disease known as ulcerative colitis Forty patients suffering from this disease were submitted to psychological examination In 37 of the 40 patients, the colitis was antedated by psychological abnormalities or definite psychological disorders well beyond the range of the normal No uniform personality type could be established Among the various psychopathological structures observed, obsessions and hysterics were prominent The importance of the emotional factor in precipitating the onset, relapses, and individual attacks of ulcerative colitis was examined in relation to the personality effected The findings appear to justify an attempt at psychotherapy for selected early cases of ulcerative colitis

JOHN W NUZZUM, M D

Mackie, T T The Medical Management of Chronic Ulcerative Colitis *J Am M Ass*, 1938, 111 2071

One of the most controversial problems in the field of disorders of the gastro-intestinal tract is chronic ulcerative colitis The bacterial flora associated with the disease rather than the anatomical and physiological changes produced were formerly made the fundamental index of the disease

Believing that continuous investigation of a group of cases over a prolonged period might yield information of value, the author made a careful study of 85 cases of chronic ulcerative colitis for periods varying from eighteen months to six and a half years Included in this study were a careful bacteriological survey, a check-up on the motor physiology of the intestine, fractional gastric analyses, and observations on allergic findings The author arrived at certain definite conclusions

The concept that ulcerative colitis is a simple infection is now no longer tenable There is much evidence to indicate that it is the complex expression of the interaction of several different factors There is initial infection of the affected portion of the colonic wall This infection is probably always mixed in character and may be initiated by any one of a number of bacteria, known to be pathogenic and to produce inflammatory lesions in the colon With the breaking down of the mucosal barrier secondary infection inevitably follows, it is caused by certain of the bacteria present in the colonic contents, notably *Escherichia coli* and *Streptococcus fecalis* Chronic ulcerative colitis is characterized pathologically by inflammation and ulceration of

the mucosa of the colon and by inflammation and progressive production of scar tissue in the deeper layers of the colonic wall It is characterized physiologically by secretory and motor disturbances of the gastro-intestinal tract The disease manifests an inherent tendency to progression and relapse Sensitization of the colon to foreign protein of bacterial and dietary origin plays an important rôle in the mechanism of activity and relapse of the disease Frequently secondary or conditioned deficiency disease occurs as a complicating factor

Successful medical management of chronic ulcerative colitis must be based on the evaluation and control of these various factors It must be guided by the phenomena observed in each particular case, since each case has its own set of idiosyncrasies and its own response to treatment The prognosis in the individual case depends necessarily on the extent of irreparable damage to the colon and on identification and control of the factors operating to maintain activity of the disease The pathologically mild and moderately advanced cases usually have a fair chance under conservative medical treatment For the pathologically advanced cases prolonged medical and surgical treatment has been found to offer the best prognosis

The great variety of anti-bacterial measures used in combating this disease have again and again proved their inadequacy Certain general measures are applicable Definite foci of infection should be appropriately treated Disturbances of normal physiology must be compensated There may be hypacidity or anacidity in a given case and it becomes important to restore the normal acid curve Hydrochloric acid in amounts up to 4 c cm with meals is of definite value in the presence of anacidity There may be hypermotility or hypomotility, and again it is important to restore the normal motor rate Sedatives such as phenobarbital and, at times, opium derivatives are useful in the presence of a hypermotile colon They are contraindicated in those cases presenting a slow colon motor rate In these cases good results may be obtained by a properly adjusted daily dose of a saline cathartic and large fluid intake Adjustment of the diet to the needs of the patient is essential A high protein, low carbohydrate diet is better tolerated than the conventional high carbohydrate "colitis diets" traditionally in use The importance of repeated investigation of the possibility of food allergy by the test diet method cannot be overemphasized The vitamin and mineral intake must be maintained at levels above the requirements of the normal individual A constant watch must be kept for the early signs of deficiency disease and when evident they must be strenuously treated Radical surgery should be seriously considered in those cases which fail to respond to conservative treatment, in those cases which exhibit the effects of chronic sepsis, and (early) in those instances which appear to present the proximal type of pathological change

MATHIAS J SEIFERT, M D

This study disclosed the discouraging facts that the majority of the cases were inoperable at the time that they were first discovered that there are no satisfactory criteria on which to base an early diagnosis, and that the survival period is generally less than one year.

The proved case of the author illustrates the treacherous character of such tumors. In this case a tumor $\frac{3}{4}$ in. in diameter was excised along with 8 in. of bowel. Despite this the child developed widespread metastases and died within eighteen weeks of its recovery.

JOHN WILTSIE EYRON M.D.

Kirsner J. B. and Miller J. F. The Roentgen Diagnosis of Intussusception. *Radiology* 1938 31: 658.

The purpose of this report is to evaluate the roentgen criteria of intestinal invagination and to present the roentgenographic observations in a series of 7 patients. Clinical and pathological aspects of the condition are given brief consideration. The diagnostic value of roentgen examination reported by various authors and the relative merits of the opaque meal and barium enema are reviewed.

The barium meal of greatest value in the diagnosis of invaginations of the small bowel. In all other types colon fluoroscopy is to be preferred. It not only shows the anatomy of the colon to better advantage but is desirable because it is less likely to interfere with subsequent surgery. The use of post evacuation films is recommended as they frequently give excellent views of the mucosal pattern.

The most frequently observed roentgen signs of invagination are (1) obstruction to the barium enema with a filling defect (2) mobility of the obstruction under manipulation (3) a palpable mass and (4) the passage of barium between the intussusceptum and intussusciptions.

All of these findings together with variations which may occur are discussed by the authors at some length.

Seven cases are cited in detail with special reference to the roentgen manifestations which they presented. In conclusion it is stated that the x-ray examination is a definite aid in the diagnosis of intussusception involving the large bowel.

ADOLPH HARTUNG M.D.

Rosenfeld L. and Fine J. The Effect of Breathing 95 Per Cent Oxygen Upon the Intraluminal Pressure Occasioned by Gaseous Distention of the Obstructed Small Intestine. *Ann Surg* 1938 108: 1012.

In a series of previous communications the authors reported on the effects of the breathing of 95 per cent oxygen upon the absorption of air from the intestines. They found that the inhalation of pure oxygen reduces the pressure of nitrogen in the lungs toward zero so that the nitrogen in the blood diffuses into the expired air and by the same mechanism the resulting reduced partial pressure of nitrogen in the blood allows this gas to diffuse more rapidly from

any body cavity or tissue space into the blood whence it is expelled through the lungs. The oxygen itself has no direct effect on the diffusion process. Its virtue lies only in the fact that when properly used it is a convenient respirable gas which prevents nitrogen from being inhaled.

In this particular series of experiments an attempt was made to show that the breathing of 95 per cent oxygen would reduce the pressure within the intestines. For this purpose a series of cats were used in which the small intestines were made into closed loops and these closed loops were distended with air or nitrogen. When the pressure was raised to 800 mm. of water pressure death ensued in most of the animals in a comparatively short period of time. In a similar series of tests in which the same procedure was used except that the animals were permitted to breathe pure oxygen the survival time was considerably longer. In the latter animal the pressure was rapidly reduced to within almost normal limits and remained within these limits. The authors therefore conclude that the breathing of 95 per cent oxygen is an effective means of reducing intra intestinal pressure and prolonging the survival time of cats in which the small intestine has been distended with air or nitrogen.

WILLIAM C. BECK M.D.

Cullinan E. R. Ulcerative Colitis. *Clinical Aspects B. H. J.* 1938 2: 1351.

Although the disease known as ulcerative colitis possesses definite clinical and anatomical features controversy still exists about the symptoms and the treatment. The present study consists of 40 selected cases of idiopathic ulcerative colitis. As regards the clinical aspects of this disease the lesion is frequently most marked in the recto-sigmoid region. No sharp distinction should be made between those cases in which it is localized in this area and those in which it is diffused throughout the entire colon. The disease affects mostly sedentary workers under the age of thirty and women more than men. It does not follow mucous colitis. When the lesion is diffuse there is often severe illness with fever and emaciation. In mild cases the symptoms are frequently characterized by anemia due to hemorrhage. Pathogenic organisms are never found in the stools. The radiological appearance is characteristic. The barium enema usually passes through the colon very rapidly and the rectum is small. Lack of colon haustration may be observed in mild cases. If there is narrowing of the colon the disease is usually severe.

The disease runs a chronic course with remissions and relapses. They are often precipitated by emotional trauma. Diagnosis is not difficult if all patients with blood in their stools are given a thorough examination. The prognosis must be guarded carefully. Occasionally complete recovery may ensue. Although it is obvious that a secondary infection of the colon exists in these patients evidence that the disease is caused by a primary infection is unconvincing.

toward surgical intervention in this disease. Worthy of note is the observation that in several instances in which ileostomy seemed imminently necessary, a sudden improvement occurred without operation. The non-operative mortality rate has not been appreciably altered by the practice of this more conservative plan.

It was noted that sex was apparently not an influential factor in the final results. Likewise the age of the patient at the onset of the disease seemed to make little difference in the results obtained in this series. Contrary to the general impression, however, the appearance of the disease after the age of forty did not improve the outlook materially.

Two important factors, prognostically, are the acuteness of the infection and the resistance of the patient. The highest mortality rate was found in the acute fulminating type of the disease. With the exception of those cases in which symptoms were present for from two to five years, there seemed to be a gradual lowering of the mortality rate, inversely proportional to the duration of the disease. Marked improvement, however, was seen less frequently in the very long-standing cases.

The authors also observed that better results were obtained in the chronic relapsing type of disease than in the chronic continuous type. The debilitating effect of the chronic disease and also the relative number of operations performed in this group may explain this difference.

The authors call attention to the fact that the extent of involvement as shown by the x-rays is not a reliable prognostic sign. If the disease is mild and the involvement is superficial, no appreciable x-ray abnormalities are to be expected. In the very acute fulminating cases pathological changes in the intestinal wall may not be sufficiently invasive to produce the so-called characteristic x-ray appearance. The patients with involvement of the rectum and sigmoid as shown by x-ray examination had a higher morbidity but a lower mortality than those with negative x-ray examination. X-ray evidence of disease of the left colon was associated with the greatest mortality and the lowest rate of improvement. In the patients showing involvement of the entire colon the rate of mortality was no greater than in those with minimal involvement, and improvement or remission occurred about as frequently as in patients with negative x-ray evidence.

It should be emphasized that the prognosis in any case of ulcerative colitis must be guarded. Some of the patients who are most severely ill, with extensive involvement, severe and continuous bleeding, and symptoms and signs of marked toxemia may suddenly or gradually show improvement and finally go into a complete remission. In most cases of this type the cause for this change is not attributable to any one specific therapeutic measure. The authors stress the importance of continuous active treatment, and the utilization of every measure to maintain nutrition and resistance at the highest possible level.

MATHIAS J. SEIFERT, M.D.

Bower, J. O., Burns, J. C., and Mengle, H. A. Spreading Peritonitis Complicating Acute Perforative Appendicitis. Experimental Studies. *Arch. Surg.*, 1938, 37, 751.

The authors emphasize the gravity of spreading peritonitis due to appendicitis. They believe that 15,000 persons will die of this condition in the United States this year. They made an extensive experimental study in which a total of 323 dogs were used. Acute perforative appendicitis was induced in these animals by ligation of the appendiceal vessels and of the base of the appendix itself. The abdomens were closed without drainage, and from 30 to 54 c.c. of castor oil were given by mouth immediately, or twenty-four hours after operation. Seventy-four per cent of the animals in this control group died in an average time of sixty-five hours. Spreading peritonitis developed in 94 per cent of the animals and there was a local peritonitis in 6 per cent. The larger the dose of castor oil and the sooner after operation it was given, the higher was the mortality. *Clostridium welchii* and other anaerobes were present so frequently in the fatal peritonitis that treatment with bacillus perfringens antitoxin was instituted. Intramuscular administration of this antitoxin (3.21 c.c. per kgm.) resulted in a striking reduction of mortality to only 34 per cent. Intravenous administration of the antitoxin was far less efficacious. A small part of the reduction in mortality following the use of perfringens antitoxin was found to be due to the antibodies present in normal horse serum, the vehicle for the antitoxin. Treatment of spreading peritonitis with immune serum combined with perfringens antitoxin had little added effect, except to prolong life, and resulted in a mortality of 33 per cent. Treatment with polyvalent bacillus-coli serum combined with perfringens antitoxin likewise gave a mortality of 33 per cent. The transfusion of whole, non-immunized dogs' blood on three successive days was decidedly disastrous, it increased the mortality to 92 per cent, in contrast to the mortality of 74 per cent in the control group. No explanation of this phenomenon is ventured. All therapeutic agents were given in doses calculated per kilogram. Post-mortem examinations demonstrated that the lowered mortality in the treatment group was due to a greater tendency of the process toward localization. In addition to lowering the mortality, perfringens therapy prolonged the duration of life in the dogs that died from sixty-five to eighty-five hours. The authors present their considerable data, but refrain from drawing conclusions as to treatment. A. F. JONES, JR., M.D.

Pergola and Rosenfeld. Progressive Cutaneous Gangrene Following a Hartmann Operation for Rectosigmoidal Cancer (Gangrene cutanée progressive consécutive à une opération d'Hartmann pour cancer rectosigmoïdien). *Mém. l'Acad. de chir.*, Par., 1938, 64, 1177.

Pergola and Rosenfeld report the case of a woman of fifty-four years who was operated upon under

Jones T E The Surgical Treatment of Ulcerative Colitis *J Am M Soc* 1938 111 20 6

At the beginning of his article the author expresses the opinion that both medicine and surgery have a definite place in the management of ulcerative colitis and advocates a wise combination of the two. He contends that the biggest problem to day is to determine the indications for one treatment or another and then to avoid delay in shifting from one to the other as soon as such indications arise. This delay he considers the greatest fault at the present time. Certain complications of this disease are quite generally considered as definite indications for surgery. Among these complications we may mention the presence of stricture, polyposis or neoplasm, perirectal abscess and regional or right sided ulcerative colitis.

The author classifies the different types of ulcerative colitis according to the severity into the following groups: (1) the fulminating cases, (2) the mild cases, and (3) the moderately severe recurring cases.

In the acute fulminating form, acute and subacute perforations may occur and operative treatment does not have much to offer. Surgical intervention in this case must take the form of ileostomy. It is a very perplexing problem to decide on the optimal time for surgical intervention during an acute fulminating attack. The mortality from both medical and surgical management is high in the fulminating type. The author believes that medical management should be employed for this type of case for three or four weeks and if improvement has not followed, ileostomy should be considered. By careful attention to the blood chemistry it is possible that the mortality may be materially lowered in the future. Since a very large amount of fluid is lost by ileostomy and since the chlorides especially are depleted, a large amount of fluid as much as 5,000 c.c. daily is sometimes necessary to replace the loss. Fortunately the fulminating variety of ulcerating colitis is not very common.

The mild cases are likewise not common. These are probably best handled medically. The patients of this type may go for ten, fifteen or twenty years with little or no inconvenience and are able to carry on their daily duties.

The moderately severe cases comprise the great majority. The frequent recurrences may last weeks or months and are often associated with considerable disability. In most instances ulcerative colitis begins in the rectum and gradually involves the upper segments. Ileostomy can be done without serious impairment to health, but it carries with it considerably more difficulty than colostomy. The author believes it best to resort to surgery while there is a possibility of a colostomy rather than to wait until an ileostomy becomes necessary.

Most medical men base their conclusions of the end result on the clinical improvement of the patient. The author observes that this is not always a safe criterion since it is necessary to correlate very accurately the proctoscopic findings with the pa-

tient's state of health. Recurrence does not necessarily mean the flaring up of the old process locally but probably an extension of the disease to another segment higher up in the colon. Eventually after several recurrences the entire colon becomes involved and the disease assumes a very serious aspect. In the acute fulminating type the entire colon may become involved within a short time which involvement depends on the severity of the disease, the virility of the organisms and the poor resistance of the host.

The primary purpose of surgery is to divert the fecal stream and put the bowel completely at rest free from infection. This is accomplished by ileostomy or colostomy. The author strongly advocates earlier colostomy. MARTIN J. SEIGER, M.D.

Willard J H, Fessel J F, Hundley J W and Bockus H L The Prognosis of Ulcerative Colitis *J Am M Soc* 1938 111 2078

Many references to the etiology, treatment and complications of so-called idiopathic ulcerative colitis are found in the literature, whereas a marked paucity of material obtains regarding the natural history and the final outcome of cases of this disease. The authors deem a study of these phases essential before any definite evaluation of specific therapeutic measures can be made. With this in mind they selected 66 patients for study, exercising extreme care to include in the series only such cases as exhibited the typical picture of so-called idiopathic ulcerative colitis. The primary requisite was diffuse involvement of the mucosa of the rectum and sigmoid. Final results were estimated on a basis of actual examination of the rectal mucosa in 80 per cent of the cases. Only such cases as had been symptom free for one year and showed no sigmoidoscopic evidence of activity were reported as being in remission.

That idiopathic ulcerative colitis is a serious disease is evident from the mortality and morbidity figures both in the literature and in this series. The results in any given series are probably dependent more on the types of disease included, the time followed, and the incidence of surgical procedure rather than on the specific therapeutic measures used. The authors report that no single therapeutic measure is particularly effective in any number of cases. Each patient has his own response to treatment and the same patient may have a favorable response to one procedure during one relapse and to another procedure during a subsequent relapse. Frequently the entire armamentarium fails to produce favorable results. Therefore in any given case a regimen including a great variety of procedures would seem to offer the best chance of success.

The authors have found in their experience that surgical intervention is one of the factors resulting in a higher mortality rate. They point out that an immediate postoperative mortality of 43 per cent and a death rate of 73 per cent in surgical cases are strong arguments in favor of a conservative attitude.

have healed completely and indicate temporary suppression of the disease process

JOHN W. NUZUM, M.D.

Ferguson, L. K. The Surgical Treatment of Pyogenic Infections of the Anal Canal. *Surg Clin North Am*, 1939, 18: 1645

Most of the pyogenic infections of the anal canal may be considered as having a common origin in the crypts of Morgagni. These crypts, which may be deep pockets when the canal is closed, lie above the anorectal line. They are lined by mucous membrane, and deep tortuous glands extend from them into the submucous tissues. Patches of lymphoid tissue lie underneath the mucosa. An infection may extend from the crypt pockets to these glands and lymphoid tissue, giving no symptoms until it reaches the adjacent skin tissue. Then the overlying skin papillae become prominent and pain is a noticeable symptom. If the anal infection progresses by burrowing, it may extend between the sphincter muscles and the mucous membrane toward the anal orifice to form a perirectal abscess. Thus most of the infections of the anal canal may be looked upon as having a single origin in the anal crypts.

Practically all of the lesions under discussion may be operated upon under local infiltration anesthesia. There seems to be no danger of spread of the infection if the incision is made through the area of infiltration. When the patient is hospitalized, a low spinal anesthesia is by far the most satisfactory. If the injection is made with the head elevated, the anesthetic solution will drop down to the bottom of the dural sac and an excellent "saddle" anesthesia will be obtained. When abscesses are incised under local anesthesia, it is important that pressure upon the area of inflammation be avoided. The T-binder is an excellent dressing in the hospital where it can frequently be replaced after soiling. After leaving the hospital, the sanitary pad is most convenient.

Pyogenic infections of the anal canal are looked upon as arising from infected anal crypts. Conservative therapy or incision and drainage of the crypt may be practiced. When a perianal abscess develops, the infected tract may be identified with a hooked probe and the abscess incised with a radical incision from the infected crypt to the farthest extent of the abscess cavity. Rapid subsidence of the infection and healing of the wound are the rule.

In this ischiorectal abscess the infection extends from the infected crypt through the sphincter muscle to invade the fat of the ischiorectal fossa. A radical incision through the abscess wall and through the infected crypt is the treatment of choice. By this method, secondary fistula can be avoided.

An anal fistula is an infected tract extending from an infected crypt to the skin surface. In addition to the primary opening, secondary tracts frequently develop. Short fistulas may be excised under local anesthesia. Long fistulas or those with secondary openings are best treated as hospital cases and operated upon under spinal anesthesia. The two-stage

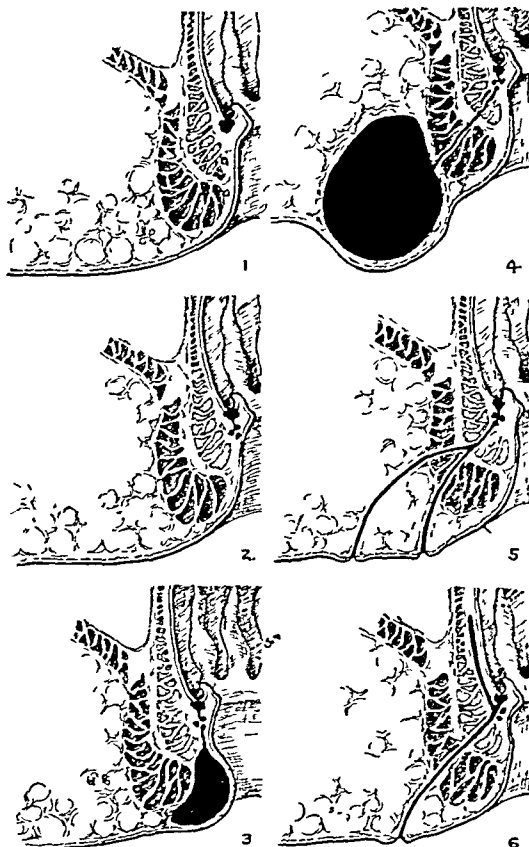


Fig 1 Semidiagrammatic drawings to show the progress of an infection from the anal crypts. 1, Infected anal crypt with ulceration. 2, Extension of the infection to the deeper glands. These glands may also lie in the muscular tissue. 3, Submucous extension of the infection to form perianal abscess. 4, Deep extension of the infection to the fat of the ischiorectal fossa to form an ischiorectal abscess. 5, Primary and secondary fistulas leading from an infected crypt to the skin surface. 6, Secondary fistula extending upward between the circular muscle of the bowel and the mucosa.

operation is recommended, the most important part of the operation being the identification of the infected crypt, which constitutes the internal opening of the fistula.

JOHN W. NUZUM, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Cheever, D. Innocent Gall Stones and Harmful Cholecystectomy? *New England J Med*, 1938, 219: 731

After pointing out the many reports in the literature of the frequent incidence of apparently harmless gall stones, the author states that many serious

spinal anesthesia for rectosigmoidal cancer because the patient was obese an abdominoperineal operation appeared impossible and the Hartmann operation was done. The immediate results of the operation were good the artificial anus functioned well and at no time showed any inflammation. However after the twenty fifth day the patient's condition became unsatisfactory a cutaneous gangrene developed around the incision in the median line (not in the region of the artificial anus on the left side) the gangrene involved only the skin but it progressed rapidly it was surrounded by a zone of inflammation. No treatment was successful in stopping its progress excision of the gangrenous tissue with the electric knife and treatment with the ultraviolet rays resulted in only temporary improvement. As the gangrene progressed symptoms of toxemia became severe and the patient died sixty eight days after the primary operation.

Histological examination of the gangrenous tissue showed nothing of special interest. Bacteriological examination of the pus showed taphylococci and streptococci culture showed micrococcus faecidus and diplococcus reniformis and the coccobacillus of Veillon in addition to staphylococci and streptococci.

This case brings the number of cases of postoperative cutaneous gangrene reported in France to 6 the first case was reported by Tixier in 1937. However this complication was reported in English and German literature as early as 1924. The fact that the cutaneous tissues alone and not the subcutaneous tissues are involved in the gangrenous process is the distinguishing characteristic of this form of postoperative gangrene. It occurs most frequently after operation on an abscessed or gangrenous appendix operation on the colon or on the rectum. The onset and advance of the gangrene is always attended by severe pain. There is little or no fever but the general condition of the patient is always poor with signs of severe toxemia.

In 1921 Meloney claimed that the characteristic bacteriological findings in postoperative cutaneous gangrene were a slightly anaerobic streptococcus and a hemolytic staphylococcus aureus. However a review of 17 cases reported in the literature in which bacteriological studies were made including the case reported by the authors shows only 2 cases in which these two organisms described by Meloney were present. In the other cases various pathogenic organisms were found streptococci and staphylococci were often present but not in the specific association described by Meloney.

Tixier reports that the use of the usual antiseptics and of serum and vaccine therapy are useless in this form of gangrene. The two most effective methods of treatment are application of a 2 per cent solution of silver nitrate to the gangrenous area followed immediately by exposure to ultraviolet light and extensive excision of the gangrenous tissue which is to be repeated if necessary and followed by skin grafting to promote healing when the infection has

been overcome. Some surgeons have reported good results from repeated excisions however in the authors case excision was done on three occasions with temporary improvement each time but without permanent arrest of the advance of the gangrene or prevention of the fatal result.

ALICE M. MEYERS

Edwards M. and Kindell F. B. The Treatment of Rectal Lymphogranuloma by Excision. A Report of 6 Cases Operated on by the Lockhart Mummery Procedure. *Surgery* 1938 4: 809.

The symptoms observed in the anorectal syndrome of lymphogranuloma inguinale may be either local or general. The local phenomena are those associated with inflammatory swelling ulceration and obstructive narrowing. The outstanding general symptoms are loss of weight secondary anemia fever and asthenia with occasional psoriasis. In the usual run of cases palliative graduated dilatations serve to keep most patients in a fair condition of moderate activity. After some little experience with the advanced cases it becomes evident that the usual maneuvers are totally inadequate for their care. Some workers have thought to combat the sequense with colostomy alone especially if the lesion is purely obstructive and will not yield to dilatation. In the presence of progressive symptoms colostomy often fails to stem the invasion and the possibility of rectal excision demands consideration.

Perineal excision has been generally frowned upon because of the high mortality resultant therefrom. The authors have performed the Lockhart Mummery excision of the rectum after previous colostomy in 6 selected cases of lymphogranuloma inguinale. Of the 6 patients 1 is dead and 5 are markedly improved. It has been possible to recognize progressive lesions while the patient's condition will still permit operative removal. If the lesion has advanced beyond the sigmoid flexure the operation of complete extirpation becomes a very formidable procedure. In 1 of the 6 patients the lesion consisted of a dense tubular structure. In the remaining 5 patients the principle feature was a softer involvement extending up to and slightly beyond the peritoneal reflection. In all there was a varying weight loss secondary anemia and continued fever. All were subjected to preliminary colostomy of the loop type followed later by perineal excision by the Lockhart Mummery procedure.

In the absence of specific therapy for lymphogranuloma inguinale it must be recognized that surgical measures still play a leading part in the treatment of anorectal lesions. In those cases failing to respond to early palliative excision should be given early consideration. The Lockhart Mummery procedure appears to be applicable to certain selected cases and is not attended nearly by a high immediate mortality rate. Results in this small series have been gratifying but they are by no means conclusive. The time elapsed since operation is only nineteen months in the oldest cases. Only 2 cases

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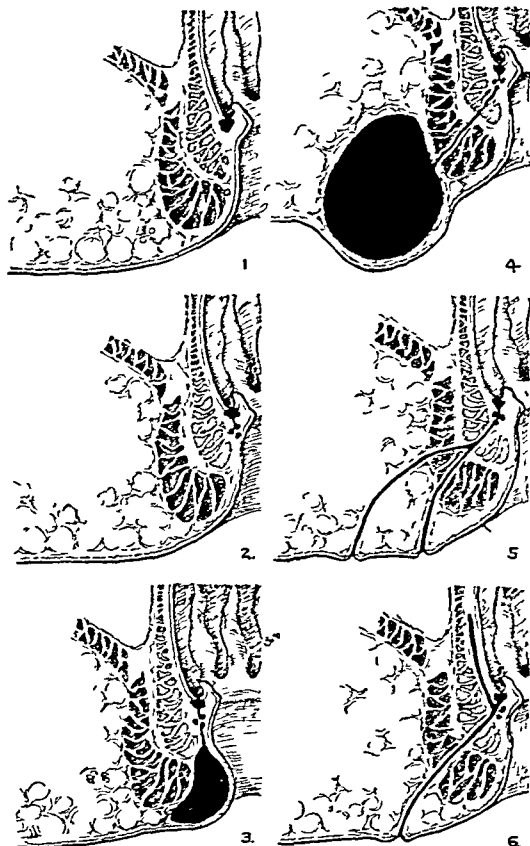


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JOHN W. NUZUM, M.D.

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Cheever, D: Innocent Gall Stones and Harmful Cholecystectomy? *New England J Med*, 1938, 219: 731

After pointing out the many reports in the literature of the frequent incidence of apparently harmless gall stones, the author states that many serious

sequela may be avoided by early removal of the gall bladder

The difficulties frequently occurring as a result of gall stones are listed as follows: mild dyspeptic manifestations, infections, acute and chronic ulceration of the stones into the duodenum ultimately causing intestinal obstruction, colic of the cystic duct sometimes resulting in hydrops, empyema or gangrene, common duct stone with its frequent production of colic jaundice and more rarely cholelithiasis, acute hepatitis, abscesses of the liver, hemorrhage, pancreatitis and finally carcinoma of the gall bladder or bile ducts. These complications the author believes are inevitable if the patient lives long enough.

Ten cases are reported in which long standing gall stones were indicated by a long history of dyspepsia and pain and cholecystectomy was finally performed because of a serious complication. The author believes that if the symptoms had been regarded seriously earlier in the disease and a cholecystectomy had been performed many years of suffering could have been avoided and the patients would have been operated upon in a much more favorable phase of the disease which would have reduced the morbidity and the mortality of the operation.

An analysis of 100 operative fatalities at the Peter Bent Brigham Hospital Boston convinced the author that in about one half of them there had been enough symptoms to permit a diagnosis and timely operation years before the occurrence of the secondary complications which were the essential cause of the fatalities.

In order to prove that removal of the gall bladder is accompanied by a low mortality and a slight morbidity and that the loss of the function of the viscous is negligible the author states that in 260 consecutive cholecystectomies excluding operations on the common duct the mortality was 0.8 per cent. In 166 cases of exploration of the common duct the mortality was 4.8 per cent. Hernia and adhesions were the chief sources of postoperative morbidity and were not frequent enough to be considered seriously.

The author concludes that cholecystectomy should be advised when a diagnosis of gall stone is made unless special contraindications exist.

THOMAS C. DOUGLASS, M.D.

Nygaard, A. H. On Post Cholecystectomy Colic.
Acta chirurg. Scand. 1935, 8, 309.

The author presents a general review of the origin and probable mechanism of the so called post cholecystectomy colic.

A case is reported in which the patient gave a history of biliary colic after cholecystectomy. The condition occurred following the intake of a variety of drugs such as morphine, ipecac, opium, aspirin or alcohol and after the performance of hard work. The ability of these drugs to reproduce the colic was observed directly and the attacks

were relieved by nitroglycerin or amyl nitrite. The possibility of spasticity of the choledochoduodenal sphincter in this patient (as well as in many others having pain after cholecystectomy) must be considered and appropriate medical therapy given.

ROBERT ZOLLINGER, M.D.

Cazzamali, P. and Pecco, R. The Regulation of the Velocity of Decompression of Endonephatic Biliary Hypertension Due to Occlusion of the Common Bile Duct (*La regolazione della velocità di drenaggio esterna della bile nelle ipertensioni endonephatiche da occlusione del coledoco*). *Arch. ital. di chir.* 1935, 49, 188.

Grave consequences are apt to result from the sudden decompression of any cavity or organ distended with fluid. Best known examples are those in connection with the urinary bladder, the abdominal cavity and large cysts. In all these instances the disturbance seems to affect the blood vessels particularly. Whether the disturbances are primarily arterial or venous is not well established.

The authors present a short review of the literature and subscribe to the theory of Judd and Lyons that the disturbance is one of the venous system principally.

In a series of experiments in rabbits the authors found that after sudden decompression of the distended extrabiliary tract consequent upon the ligation and division of the choledochus there was marked vasodilatation and congestion of the liver which was filled with blood throughout the parenchyma in places veritable lakes of blood formed while in other regions there was extravasation of the blood into the tissues. In a second group of experiments in which the decompression was prolonged none of these marked changes was noted. In these animals there was some tissue change in the liver which probably was the result of prolonged biliary stasis.

For purposes of applying this principle in clinical practice the authors devised and describe an apparatus in which the bile is made to flow against a pressure which is adjustable. In this way the velocity of external drainage may be regulated.

A. LOUIS ROY, M.D.

Thomsen, V. Studies of Trauma and the Carbohydrate Metabolism with Special Reference to the Existence of Traumatic Diabetes. *Acta Med. Scand.* 1918, Supp. 91.

This monograph, printed in English with a summary also in Danish, covers thoroughly the subject of traumatic diabetes. The historical background and present viewpoints are reviewed. It is pointed out that the conceptions of the causal relation of trauma and diabetes have been increasingly subjected to criticism and skepticism. The author has studied the influence of trauma on the carbohydrate metabolism of 143 non-diabetic individuals and has reviewed and tabulated 81 cases of reported traumatic diabetes. The findings and clinical course in

this material are evaluated on the basis of a series of questions which had been formulated by Noorden in the belief that the answers thereto would throw some light on the relation of trauma to diabetes

The author emphasizes the following viewpoints, most of which are at variance with hitherto prevailing opinions "If physical traumata—with the exception of direct pancreas trauma—are at all able to provoke diabetes, this property must be attributed to every trauma regardless of its kind and location. In human beings were found neither experimental nor clinical clues justifying the assumption that the post-traumatic sympathicogenous disturbances in the carbohydrate metabolism can lead to diabetes. Since a physical trauma can only give rise to a temporary exacerbation of existing diabetes, it can not be thought to 'activate,' i.e., bring about a permanent exacerbation of latent diabetes. It is admitted that the trauma, if the sympathicogenous disturbance in the carbohydrate metabolism depending on it is added to the existing pancreatogenous disturbance, can give rise to temporary glycosuria and, thus, make it possible to diagnose an existing latent diabetes. It is demonstrated that the claim involving the acknowledgment of a diabetes as being traumatic, namely, that the patient has not previously presented any diabetic symptoms, is insufficient. Traumatic diabetes after a direct, severe pancreatic lesion is acknowledged as a theoretic possibility."

Although the author admits in theory that diabetes may appear as a direct sequel to a pancreatic injury causing extensive destruction, he believes that other physical traumas are unable to cause diabetes. An injury may cause an exacerbation of existing diabetes, but the exacerbation that occurs immediately after the trauma is only temporary. The frequent assertion that an injury can exacerbate a latent diabetes and make it manifest cannot be maintained.

WALTER H. NADLER, M.D.

Crile, G., Jr. . Successful Resection of the Head of the Pancreas for Carcinoma. Report of a Case
Cleveland Clin Quart, 1938, 5 250

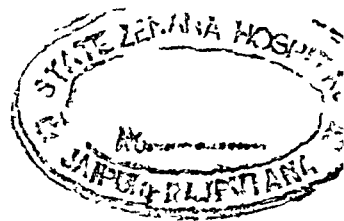
The case reported is that of a ductal carcinoma in a man thirty-seven years of age. Operation was carried out in two stages: first a cholecystogastrostomy was performed, and two months later the head of the pancreas was resected.

Prior to the first operation the icterus index was 100, and the blood phosphatase 6.6 units. The course following this operation was stormy; there was marked hemorrhage, and a septic type of temperature which was interpreted as being due to cholangitis. To control the hemorrhage, a total of 4,500 c.c. of blood was administered during the first seven postoperative days.

The second operation was done under spinal anesthesia. To facilitate the procedure the gastroduodenal omentum was divided along the greater curvature of the stomach. The duodenum was divided just distal to the pylorus and the latter was inverted; the gastroduodenal artery was ligated, as was the common duct, and the duodenum was mobilized from its lateral border and again severed, this time in the third portion. The hand could then be inserted behind the pancreas, which was adherent to the duodenum. A finger was placed beneath the neck of the pancreas, well beyond the tumor, and the pancreas was cut across. The pancreatic duct was markedly enlarged and this, together with the pancreas, was sutured with 3 mattress sutures of alloy steel wire. The entire head of the pancreas with the tumor was lifted out *en masse*. Troublesome bleeding occurred in the veins of the region. A gastro-enterostomy was then performed.

The convalescence from this operation was also stormy, with hemorrhage and cholangitis again supervening. Again recourse was made to numerous transfusions (a total of 3,500 c.c. of blood) and to the use of large quantities of intravenous glucose.

JOHN WILTSE EPTON, M.D.



GYNECOLOGY

UTERUS

Emmert F V Gellhorn Dickinson Technique of Vaginal Hysterectomy for Prolapse of the Uterus *Surg Clin North Am* 1938 18 7315

In order to understand the technique of the various operations for prolapse of the uterus it is essential to have a clear understanding of the anatomy. The author quotes Chipman's description which he considers unusually clear. The technique which is described contains the following features (1) the two suture method described by Dickinson (2) interposition of the bladder between the round ligaments and anterior vaginal wall to prevent a recurrence of cystocele and obliteration of the posterior cul-de-sac to avoid an enterocele according to Gellhorn and (3) utilization of the uterosacral ligaments to assure a moderately deep vagina and the prevention of herniations.

The steps of the operation are as follows:

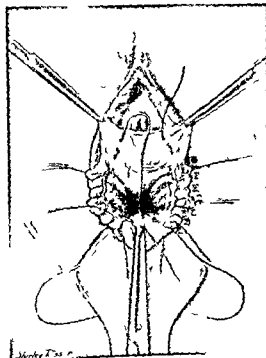


Fig 1 The uterus has been removed. A purse string suture has been placed through the peritoneum so that the stumps of the broad ligament and round ligament are extraperitoneal. A Uterosacral ligament. B C base of broad ligament. D uterine vessels. E F stumps of broad ligament. G stumps of round ligament and tube.

With the cervix grasped and pulled down, a needle is inserted through the lateral fornix on either side parallel with the cervix to a depth of 3 or 4 cm. Twenty c cm of 1% per cent novocaine solution are injected on each side. Both the anterior and posterior vaginal walls are then infiltrated throughout their entire lengths. Complete circumcision of the cervix is made slightly above the site at which the vagina becomes continuous with the cervix. This incision is carried down through the fascia to the surface of the cervix except laterally where only the mucosa is incised (to avoid excessive bleeding from the vaginal vessels). The bladder is pushed upward away from the cervix and laterally away from each broad ligament. This exposes the vesicocervical space up to the peritoneal fold and the uterine vessels laterally. The cervix is pulled upward toward the symphysis and an opening made through the peritoneum posteriorly into the cul-de-sac. The incised margin of peritoneum overlying the rectum is sutured to the posterior vaginal wall to control bleeding.

The uterosacral ligaments are identified as they converge toward the uterus. These are clamped. Starting on one side and employing a full length chromic suture the operator ligates and cuts the uterosacral ligament. The needle threaded with this same suture is then guided through the base of the broad ligament. After the suture has been tied it is anchored to the adjoining vaginal wall. The base of the broad ligament is then cut between the suture and the cervix. The stitch is continued upward to ligate the Mackenrodt ligament and the succeeding portion of the parametrium then the uterine vessels. After the peritoneal cavity is entered through the vesico uterine fold so that the bladder can be retracted and the tube and round ligament made accessible the original suture is continued upward to include these structures. The other side is treated similarly (Fig 1). The peritoneal cavity is now closed with a purse string suture.

The anterior vaginal wall is next separated from the bladder by blunt dissection and suitably resected. The bladder wall is plicated and the bladder fascia is approximated. The needle on the ligature of the stump of the round ligament is placed through the vaginal wall near the upper angle of the wound on either side. When these two sutures are tied the bladder is pushed backward and out of the way. The stumps are now interposed between the bladder and anterior vaginal wall. Interrupted sutures approximate the bases of Mackenrodt's ligaments and the uterosacral ligaments; these sutures pass through the vaginal margins also.

A triangular piece of mucosa is then removed from the posterior vaginal wall with the apex of the triangle high in the vagina and the base at the

mucocutaneous margin The fascia over the rectum is plicated, the levator-ani muscles are brought together in the midline with interrupted sutures, and the overlying fascia is approximated with a continuous suture Interrupted catgut sutures are used for the vaginal mucosa and black silk for the transverse mucocutaneous margins

The technique of the operation is clearly illustrated by numerous drawings

DANIEL G. MORTON, M.D.

Démarez, R Puerperal Abscess of the Uterus, An Anatomico-clinical Classification (Les abcès puerpéraux de l'utérus, essai de classification anatomo-clinique) *Gynéc et obst*, 1938, 38 161

The term "abscess of the uterus" denotes an abscess located near the base of the uterus or in the cornua, but not diffuse miliary suppuration involving the entire myometrium The author has collected 63 cases from the literature He found the incidence of puerperal abscess to be from 70 to 80 per cent, 72 per cent of the abscesses being postpartum The streptococcus is the organism most commonly responsible for the condition, but occasionally the staphylococcus, gonococcus, or bacillus coli may be found Infection occurs nearly always by the direct genital route, and but rarely by contiguity or via the blood stream Although elective localization at the base of the uterus or cornua is usually attributed to the rich lymphatic supply in this region, the present writer emphasizes the role of angular basal metritis Lesions of the placenta or uterine mucosa afford a splendid soil for the proliferation of bacteria Local resistance is facilitated by the abundant vascular reticulum of the uterus, but may be destroyed by transitory plugging of the tubal orifice with mucus or edema, by the persistence of wolffian or muellerian embryonic debris, by a small necrotic fibroma, by nabothian ova, or by traumatism General resistance is influenced by the general condition of the patient, her power of reaction, and her state of allergy or anergy toward the invading organism Clinically, a febrile puerperium is frequently associated with extreme sensibility of the uterine cornua The lymphangitis may subside spontaneously or go on to abscess formation Septic traumatism and localized infection of the mucosa lead to solitary abscess Diffuse infection of the myometrium and puerperal septicemia in a debilitated patient lead to disseminated miliary abscesses In the presence of efficient resistance either mode of invasion may lead to single or multiple encysted foci

Sixty per cent of these abscesses occur in the base of the uterus, with a predilection for the left cornua (40 per cent), and then in decreasing order of frequency, on the posterior surface, the anterior surface, the margins, the inferior segment, and the cervix Eighty-five per cent of the abscesses are subperitoneal, intramural abscess is rare Submucosal abscesses may remain unrecognized because of their benign course and tendency toward

spontaneous rupture into the lumen of the uterus The abscess is single in 80 per cent of the cases but the possibility of a second or third abscess must be kept in mind The abscess is usually the size of a nut, the interstitial type being smaller and the subserosal type larger Parametritis and pelvic phlebitis may result from an inflammatory reaction of the adjoining tissues The course may evolve toward chronicity or spontaneous resorption, or may extend to the adjacent tissues with final rupture into the sacral viscera, rectum, sigmoid, bladder, or peritoneal cavity The ordinary type of subserosal abscess of the base of the uterus ruptures into the abdomen and has a very serious prognosis, whereas submucosal and cervical abscesses go on to spontaneous extra-abdominal rupture by the genital route and are less dangerous, although less common

Puerperal abscesses usually develop in young primiparas following delivery by forceps or artificial delivery After an initial ordinary endometritis, the actual abscess process begins in the second week and is accompanied by a high temperature, sallow facies, subicteric conjunctivæ, chills, nausea, and vomiting There is severe hypogastric pain with a flexible abdominal wall and a large soft uterus At rare intervals a progressive rescent of the uterus follows an initial normal involution The uterus is then very painful to the touch, and palpation reveals a soft cervix The uterus is still movable on combined palpation In a third stage the general signs give way to physical signs The former subside, while attention is drawn to subumbilical pain, slight hypogastric tension, and persistent distention of the bowel The constancy of this pain together with the presence of a tumor demonstrable by combined palpation, constitutes a new symptom of localization Rather than a rounded fluctuating focus of pus one may expect to find a uterine deformity comparable to that of an angular pregnancy of the second month, or of a small degenerating fibroma with vaguely defined margins The syndrome is rarely complete and often abscess is suggested only by symptoms due to extension of the infection to the surrounding tissues At this stage there is still time to intervene, otherwise almost inevitably intrarectal, intraperitoneal, or intravesical rupture ensues General infection, local extension of the inflammation, or metastatic septicopyemia may cause death at any stage of the disease In cases in which operation has not been performed the mortality rate is 75 per cent or more

In abscess of the anterior wall of the uterus vesical symptoms are prominent, while in abscess of the posterior wall rectal symptoms predominate Subacute or chronic abscess is characterized by dysmenorrhea, febrile attacks, and pains responding to the application of ice, with short or long remissions and the eventual appearance of a fluctuating mass

In miliary abscess one has to deal with pure puerperal septicemia following initial septicemia or ordinary endometritis A sign which is of aid in

diagnosis is the demonstration in successive examinations of a progressive reascend of the uterus after initial involution. If the course is prolonged an effective fight may be launched against the puerperal infection but this is rarely the case. Some cases of miliary abscess go on to resorption. In other cases several abscesses of varying but small size may develop. When the usual symptoms are vague diagnosis may depend upon clinical findings such as the persistence of a severe infectious state in spite of complete evacuation of the uterus and the absence of peritoneal symptoms and positive blood findings combined with leucocytosis and polymyocleosis. When the usual chemotherapeutic methods fail as well as serotherapy and immunotransfusion operation is indicated. Early intervention rather than any special technique is the key to success.

Submucosal and cervical abscess may be approached by the lower route. In abscess of the base of the uterus posterior colpotomy is insufficient. The abdominal route with either simple drainage or hysterectomy is preferable. The former may be used as a last resort in desperate cases or in young women with good resistance in whom a single subacute abscess may be removed like a tumor.

In the majority of cases subtotal hysterectomy is the operation of choice. Total hysterectomy is rarely indicated. Intervention by the lower route may be made in a few cases of extra abdominal development. As a rule exploratory laparotomy should be followed by a rapid hysterectomy. If medical measures have failed one should not hesitate to operate even when there is only a vague indication of uterine localization.

EDITH SCHANCHE MOORE

Waegeli C. Colposcopy and Early Diagnosis of Cancer of the Uterine Cervix (La colposcopie et le diagnostic précoce du cancer du col utérin) *Gynec et obst* 1938 38 248

Waegeli in studying the method of colposcopy used by Hinselmann at the latter's clinic is convinced that the chief value of the method is that it makes the diagnosis of cancer of the cervix possible at such an early stage that the cancer can be definitely cured. Hinselmann claims cures in 100 per cent of the cases in which the diagnosis was made by the colposcope before other methods of examination demonstrated the lesion. The application of acetic acid (3 per cent solution) aid in the differentiation between benign and malignant lesions.

As shown by the colposcope the characteristic lesions in which microscopical examination always shows an abnormal or atypical epithelium are leucoplakia, the leucoplasic base lesion and areas of mosaic. Leucoplakia appears as white spots or areas of varying extent while in itself benign this condition may undergo malignant degeneration. The leucoplasic base lesion appears on colposcopic examination as an area showing numerous small red spots, sometimes with cornified borders. Schiller's

iodine test must sometimes be used to distinguish these areas from inflammatory lesions. In mosaic areas the figures of the mosaic are white and separated from each other by red lines. Other benign lesions shown by the colposcope are (1) ectopia, a proliferation of the cylindrical epithelium; (2) zones of transformation in which stratified pavement epithelium is replacing the proliferating cylindrical epithelium in the areas of ectopia; and (3) true erosions. Cancerous ulceration shows a characteristic appearance with necrotic areas and small white spots, a serosanguinous purulent secretion and marked vascularization.

On the basis of microscopic examination of the lesions demonstrated by the colposcope Hinselmann has distinguished four types of atypical epithelium which he designates a matrix. The two chief groups are Matrix I, simple atypical epithelium, and Matrix III, atypical epithelium with excess proliferation. In Matrix I the epithelium is characterized by its power of cornification; the cells of the median layer are absent, the germinal cells are proliferating but in an orderly manner. In Matrix IIa the cells are of the same type but form excrescences on the surface. In IIb, they invade the neighboring connective tissue and in IIc they invade the glands. In Matrix III the cell also have the power of cornification; the germinal cells show much more extensive proliferation of a disordered type so that all signs of the normal layers of the epithelium are absent; the nuclei of the cells show marked polymorphism in size, form and staining reactions and there is more or less mitosis, a definite sign of malignancy. Matrix IVa showing the same type of cellular proliferation is characterized by cellular excrescences on the surface of the epithelium. IVb by invasion of the connective tissue and IVc by invasion of the glands. Different grades of epithelial proliferation may be found in the same cervix.

If the colposcopic examination shows only areas of leucoplakia, leucoplasic base lesions or mosaic lesions, microscopic examination of such areas is not necessary, but repeated colposcopic examinations should be made every two, three or six months. However, if these lesions are extensive or show a tendency to extend, amputation of the cervix should be done by Bonney's method and the tissue removed should be examined histologically. If this examination shows only Matrix I and II, no further treatment is necessary. Even if Matrix III is present, expectant treatment is indicated; if continued observation but no further operation unless there is sign of recurrence. Hinselmann has found that such recurrence is exceptional after amputation when Matrix III is found histologically, although this lesion may be regarded as a very early or superficial form of malignancy. If Matrix IV is present, especially IVb or IVc, vaginal hysterectomy or radium treatment according to the physician's preference is indicated. Only in this way can cancer of the cervix be cured in a large percentage of cases.

and the development of inoperable growths be prevented Hinselmann, as noted, claims cures in 100 per cent of the cases
ALICE M MEYERS

Taussig, F J. A Study of the Lymph Glands in Cancer of the Cervix and Cancer of the Vulva
Am J Obst & Gynec, 1938, 36 819

A total of 1,271 lymph glands which were removed because of the presence of carcinoma in the vulva or cervix, showed a fairly constant anatomical distribution of the tributary lymph channels

Five groups were studied in this series (1) the inguino-femoral chain (including Cloquet's gland), (2) the external iliac glands, (3) the obturator glands, (4) the hypogastric glands, and (5) the ureteral glands

In a series of 864 glands available for further microscopic study, a great variety of histological changes were noted Follicle hyperplasia was relatively frequent in the inguino-femoral chain and in the unirradiated pelvic lymph glands In the external iliac group, fatty infiltration was the usual picture

There was a striking absence of lymph follicles in those glands which had been subjected to heavy pre-operative irradiation, hence, there is little doubt that follicles are destroyed by this treatment

The frequency of hyaline degeneration points to a possible connection between this pathological change and the products of cancer metabolism

The author reports 9 cases of endometriosis in the lymph glands, which would indicate a high incidence of this anomaly with cancer of the cervix Confirmatory evidence of the endometrial character of these lesions lies in their association with ovarian endometriosis in 3 instances The frequency of lymph gland endometriosis in cancer of the cervix may possibly be explained by a blocking of the cervical canal with open lymph gland channels, above the point of blocking

Cancer metastases occurred in 46 per cent of vulvar cancers and in 35 per cent of Group II cancers of the cervix In cancer of the vulva, the inguino-femoral chain was most often involved, in cancer of the cervix, the hypogastric glands

The operative complications and the mortality in these operations on the lymph glands were relatively slight Four of 53 (7.5 per cent) Basset operations ended fatally, and only 2 of 83 (2.4 per cent) patients who had undergone lymphadenectomies for Group-II cancer of the cervix died

EDWARD L CORNELL, M D

Danforth, W C The Place of Vaginal Hysterectomy in Present-Day Gynecology
Am J Obst & Gynec, 1938, 36 787

Within the time covered by this report, 451 subtotal hysterectomies were performed In this same period, the author performed 90 total hysterectomies, and vaginal hysterectomy was done 266 times with no mortality

The postoperative course of the patients who had undergone vaginal hysterectomy was smoother, on

the average, than that of a similar number of patients who had undergone abdominal hysterectomy. The advantage of the vaginal attack was more apparent in older women, particularly in those who were operated upon for marked descensus While the morbidity in these patients was a little greater than that in the patients operated upon by the simple technique used for other indications, recovery has been far smoother than would be expected in a group of similar age, upon whom a combined vaginal and abdominal operation had been done The fact that the operation is almost extraperitoneal in cases of marked descensus or prolapse doubtless contributes a great deal to the smoothness of the recovery In the author's cases, the Mayo operation was usually the one chosen

In 2 patients, injury to the bladder occurred This was recognized at once and the wound was closed, the patients recovered In 1 patient, there was active bleeding from the uterine artery because of the slipping of a clamp This was controlled in time to prevent any serious loss of blood There were 4 cases of postoperative bleeding

In 1 patient, a serious thrombophlebitis followed operation Recovery followed conservative management In another patient, a pelvic abscess developed six weeks after operation This was opened and recovery followed In 2 patients operated upon for prolapse, the results were unsatisfactory

Vaginal hysterectomy is a procedure of great value, and is worthy of more extended use than it receives in many clinics today However, its adoption by occasional operators or by the general surgeon without gynecological training would probably not be of advantage
EDWARD L CORNELL, M D

EXTERNAL GENITALIA

Dutra, L H The Follicular Hormone in the Treatment of Vulvovaginitis in Children (O hormônio folicular no tratamento das vulvo-vaginites infantis)
Ann brasil de gynec, 1938, 3 326

The author states that in 1933 Lewis instituted the treatment of gonorrheal vulvovaginitis in children by means of follicular hormone, his idea was to produce a change in the epithelial lining of the infantile vagina, similar to that occurring during the menarche, and thus to create an unfavorable milieu for the development of the gonococcus There were various objections to this method of treatment, such as the possibility of swelling of the breasts and uterine hemorrhage, ripening of the follicles and subsequent ovarian insufficiency, and the production of carcinoma However, experience up to the present time has shown that these fears were without foundation The mechanism of action of the follicular hormone in vulvovaginitis consists in the production of certain changes in the vagina the number of layers of the epithelial cells is greatly increased and the cells are more keratinized, with resulting copious desquamation, the leucocytes soon disappear from the smears made of the vaginal secretion, and the

bacterial flora change from Type III to Types II and I the reaction of the vaginal milieu becomes acid returning to alkaline later when the treatment is suspended. There seems to be also a hormonal action through the vagosympathetic system which innervates the genital organs.

During a period of eighteen months the author had occasion to treat 12 girls aged from two to ten years who were suffering from vulvovaginitis in all but 2 of them the presence of the gonococcus was demonstrated. The treatment consisted of weekly deep intramuscular injections of 10 000 international benzoate units of folliculin and local treatment. Cure was obtained after 3 injections in 8 patients after 4 injections in 3 patients and after 6 injections in the remaining patient. Two of the children presented the complication of gonorrheal conjunctivitis which was rapidly cured within a few days under the usual treatment and was consequently also favorably influenced by the folliculin treatment. As secondary reactions to be attributed to the treatment fine pubic hairs and development of the labia majora occurred in 3 patients and enlargement of the breasts in another 3 these reactions were not caused by the total dose given as they appeared in the beginning of the treatment. Local treatment included 3 vaginal irrigations per week with a 1:1000 solution of silver proteinate given through a double flow catheter to remove secretions and desquamated epithelium and to influence the germs chemically, and 2 sitz baths per day for purposes of cleanliness. Smears of the vaginal secretion were taken for control every week. Consequently the average amount of follicular hormone necessary to obtain a cure of gonococcal vulvovaginitis in children is 30 000 international benzoate units and when weekly injections of 10 000 units are given the discharge usually disappears after the third injection. RICHARD KEMEL M.D.

MISCELLANEOUS

Caldwell W. E. and Moloy H. C. *Anatomical Variations in the Female Pelvis Their Classification and Obstetrical Significance*. P. W. Roy Soc Med Lond 1938 32: 1.

Six years ago believing that certain pelvic abnormalities not adequately described in obstetrical texts played an important part in the cause of dystocia and increased the difficulty in operative delivery the authors undertook a detailed study of the female pelvis. Investigation on the skeletal material in several museums revealed that the accepted obstetrical classification of pelvis failed to give a true concept of the marked variation in pelvic shape which existed in skeletal material. This suggested the need for roentgenological study of the pelvic form in living women. A method of taking stereo roentgenograms was developed which permitted three dimensional visualization of the pelvic cavity from the inlet to the outlet.

Patients who had encountered major difficulties during labor were studied and the difficulties were

then correlated with the size and shape of the pelvis. It was found that the various types of pelvic shape observed in the skeletal material were present in living women. Also studied by roentgenological examination was the mechanism of labor during labor and in some instances films were taken just before the termination of labor by operative delivery.

The technique of pelvi-radiography is described. The special stereo-copic arrangement allowed an ordinary measuring rule to be used on the pelvic image and any desired pelvic diameter at any level of the pelvis could be measured directly. In each instance a lateral film of the pelvis was taken and also a view of the subpubic arch.

It was found that among female pelvises one may distinguish 4 characteristic inlet shapes (Fig. 1). The following terminology was developed:

1. The anthropoid type resembling the long narrow oval pelvis of the anthropoid ape.

2. The gynecoid type showing all the well known architectural characteristics of the normal female pelvis.

3. The platypelloid type. This pelvis has a wide transverse oval appearance.

4. The android type which bears a morphological resemblance to the human male pelvis. The inlet is wedge shaped or blunt heart shaped.

The skeletal material at the Hanna Museum (147 white women and 121 negro women) showed the following incidence of the 4 standard types:

| Type (Pelvis) | F. mal. White Per cent | F. mal. Negro Per cent |
|---------------|---------------------------|---------------------------|
| Anthropoid | 23.5 | 40.5 |
| Gynecoid | 41.4 | 42.1 |
| Platypelloid | 2.6 | 1.7 |
| Android | 32.5 | 15.7 |

Many pelvises are borderline types containing characteristics of each of these 4 parent groups. For purposes of analysis and description the pelvis was divided into an anterior and posterior segment by passing a coronal plane through the widest transverse diameter of the inlet and the interspinous diameter. The posterior segment may conform to one standard shape and the anterior half to another. By suitable combinations the terminology suggested for the parent forms may be used to describe these borderline types. The first term describes the shape of the posterior segment and the second term indicates the shape of the anterior segment. For example the term anthropoid gynecoid is intended to designate a borderline type between the anthropoid and gynecoid type which is a long wide oval in shape.

In addition to variations in the shape of the inlet pelvises may vary in the lower portions. Thus pelvic capacity at midpelvis or at the outlet may be diminished transversely or anteroposteriorly because of differences in the inclination of the sacrum, the width of the sacrosacral notch, or the width of the subpubic angle. Therefore the regions of the lower pelvis must be described in detail.

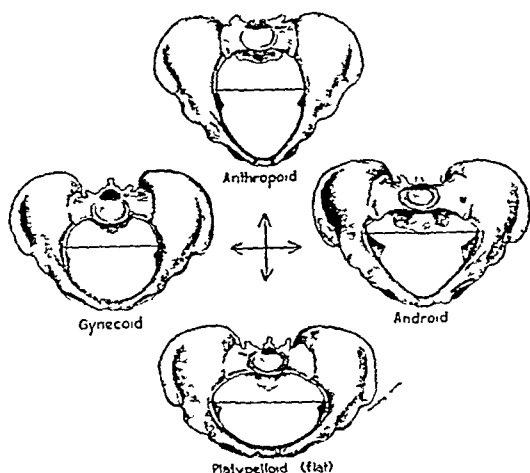


Fig 1 The Four Classical Pelvic Types The four standard or parent types divided into an anterior and posterior segment by a coronal plane passing through the widest transverse diameter and the interspinous diameter In the illustration only the widest transverse diameter is shown

In addition to a complete description of the pelvic cavity, the lengths of the cardinal pelvic diameters should be obtained

Regarding the mechanism of labor, it was determined by roentgenological examination during labor that engagement begins with the head assuming a moderate degree of asynclitism, or showing a tendency toward a posterior parietal presentation The anterior parietal bone descends behind the symphysis in a *downward and backward direction* until the head is fitting squarely in the pelvic canal The lower uterine segment and cervix, while dilating in active labor, serve as a guiding factor during engagement There may be marked variations in the position of the axis along which engagement takes place, i e it may be close to the symphysis or close to the sacrum In certain cases the causative factor for these variations is the size and shape of the pelvis, and in others, the length, strength, or character of the supports of the lower uterine segment

The relation of the pelvic shape to the position of the head at the pelvic brim was studied in 199 unselected cases Transverse positions were found to be three times as common as the other positions In gynecoid and android pelvic types transverse positions occurred in approximately 70 per cent of the cases In anthropoid types (long, narrow inlet) transverse positions were found in only 37.5 per cent of the cases, while anterior and posterior positions were found in 34 per cent and 28 per cent, respectively Usually, in spontaneous deliveries, the position assumed by the head at engagement is maintained to a low level in the pelvis before anterior rotation begins In a case of arrest it is evident that a knowledge of the pelvic shape will enable the ob-

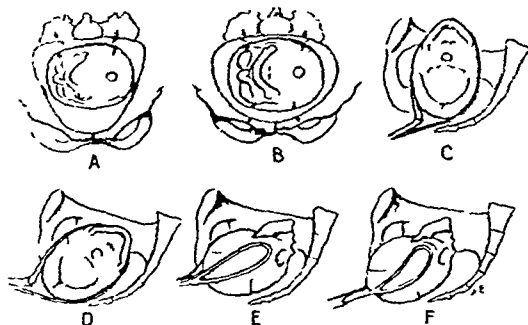


Fig 2 The Mechanism in Android Types with Straight Side Walls, and in the Flat Type of Pelvis A, Anterior rotation is resisted by the opposing forces between the head and the flat posterior pelvis in certain android types B, Anterior rotation is resisted by opposing forces between the head and the posterior and anterior walls of the pelvis in flat forms C, Barton forceps applied to the head D, Descent with lateral flexion The head follows the curve of the lower sacrum and coccyx E, Anterior rotation is effected at a low level on the inner aspects of the pubic rami or under the subpubic arch after the head has been deviated away from the influence of the posterior pelvis F, Barton forceps are removed and a cephalic application of pelvic curved forceps is made for the low terminal delivery

stetrician to determine whether it is advisable to maintain the position of arrest to lower levels, rotate at the level of arrest, or elevate and rotate at a higher level in the pelvis

Analysis of the cases revealed that spontaneous delivery usually occurred in the gynecoid forms, while forceps deliveries and cesarean section were frequent in the android forms The anthropoid pelvis is relatively efficient The smaller the pelvis the greater is the chance of obstetrical difficulty, regardless of shape Small pelvises were found among all pelvic types No single small diameter is an index of pelvic capacity, however, as often there is compensatory space in another diameter Thus the entire pelvis must be considered

The type of the pelvis has a marked effect upon proper forceps technique The discussion of transverse arrest is based upon an analysis of the 48 cases which occurred in 100 cases of medium forceps delivery Usually, delivery was accomplished by the cephalic application of forceps (the authors prefer the Barton forceps) to the infant in transverse position, with lateral flexion, descent to the pelvic floor in the same position, and low anterior rotation (Fig 2) This mechanism is proper in android pelvises with straight side walls, and in flat pelvises Attempts to rotate the occiput anteriorly in midpelvis would be difficult in these pelvic types as the greatest room is offered in the transverse diameter Ease of rotation in midpelvis usually indicates ample space in the anteroposterior diameter In the android pelvis in which there is a narrow interspinous diameter, anterior spiral rotation with descent is advised in order

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| Type (F 1) | F 1 W P | W Cent | F 1 N P | N Cent |
|--------------|------------|-----------|------------|-----------|
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| Android | 3 | 5 | 15 | 7 |

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would be ideal if this relationship could be used therapeutically. We are still far away from this ideal, and it is therefore most essential to review the large clinical material or experiences critically in sections.

The author has carried on hormonal investigations at the Wuerzburg clinic since 1932, on upward of 1000 cases. The next portion of the author's article deals with the hormonal treatment of pruritus and kraurosis vulvæ. These studies were concluded in July, 1937. After reviewing critically the treatment before this time the author gives the results of his own treatment of both conditions with follicle hormone, and gives examples of the action of the hormone in individual instances. He emphasizes the necessity of sufficiently large doses and prolonged observation.

While most of the patients had reached the menopause, there were 3 women still menstruating who were treated for pruritus. It was shown that even large doses of estradiolbenzoate did not influence menstruation if they were not injected before a certain day of the menstrual cycle, usually the tenth. Injections before this time will cause a delay of the next period. In experimenting for a period of eight months it was definitely proved that this day exists for each individual, but it does not coincide for each individual. Occasionally a true essential pruritus may be confused with symptoms which suggest symptomatic pruritus (diabetes, nephritis, eczema). In such cases at least a trial with hormone therapy is indicated. It is much more difficult to influence the pruritus of kraurosis vulvæ. The

author cites a case in which after failure of many measures excision of the vulva, chordotomy, and hormone therapy finally led to some measure of comfort. In another case with milder kraurotic changes hormone therapy seemed to effect a cure. In addition to the injections of hormone the author also used hormone ointment locally with good results.

After discussing the results obtained at other clinics with hormone therapy of kraurosis and pruritus the author discusses the hemorrhages which occur during the hormone treatment. He shows that these hemorrhages occur from endometriomas which have become hyperplastic under large doses of estradiolbenzoate. They usually arise when the artificially high hormone blood content is gradually lowered. In women in the menopause they are to be considered in contrast to the hemorrhages, which occur in women who still have their regular cycle, when the hormone treatment produces irregular bleeding. His own and other observations bring up the question whether kraurosis or pruritus can really be considered as being due to lack of ovarian function. Several factors point to the fact that the favorable influence of both hormones of the germ glands upon the skin is not a specific one. In conclusion the author reports his own cases. Of 27 patients, among whom 10 had kraurosis, 14 became symptom-free, and 3 (all with kraurosis) revealed failure after treatment. Of the other 10, 5 showed permanent improvement in their condition and 5 temporary improvement.

(BUSCHBECK) LEO A. JUHNKE, M.D.

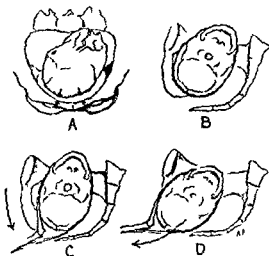


Fig 3 The Mechanism with Arrest in the Fore Pelvis Close to the Symphysis and Descending Lubric Rami A Arrest in the fore pelvis is the transverse position in an android gynecoid type. Anterior rotation is resisted by the flat surface of the fore pelvis. (The head may present close to the symphysis in any position.) B Lateral view with transverse position illustrated. The lateral side of the head tends to be close to the posterior aspects of the symphysis. C The head is lodged upward and then slightly downward and backward by manual or instrumental methods. D By lateral flexion the head descends into the outlet and under the subpubic arch where anterior rotation is carried out.

that use may be made of the compensatory space in the sagittal plane at this level. This is the only type of pelvis in which this mechanism is applicable. Occasionally transverse arrest occurs in the fore pelvis close behind the symphysis (in any pelvis which presents a flat surface to the lateral aspects of the head e.g. an android gynecoid type in which there is compensatory space in the wide well formed forepelvis). In the delivery an attempt must be made first to elevate and flex the head laterally away from the symphysis before anterior lateral flexion and anterior rotation may occur thus misdirected force against the pubic ramus is avoided (Fig 3). When midpelvic transverse arrest occurs in an anthropoid pelvis anterior rotation at the level of arrest should be carried out if possible as it is mechanically undesirable to have the head descend to a lower level in this position. If there is extreme narrowing toward the outlet the head may have to be pushed up in order to rotate it. Low transverse arrest has never been observed by the authors in association with any pelvis possessing an anthropoid or long oval shape.

In 31 of 100 medium forceps deliveries the head was found in the occipitoposterior position. In 10 of these delivery was accomplished by manual rotation to the transverse position followed by the

application of Barton forceps. By lateral flexion and traction the head descended to a lower level in the transverse position where anterior rotation was performed. In 4 cases the Scanzoni maneuver was employed and in 4 others the head was brought to the floor in the occipitoposterior position. Posterior arrest in the midpelvis was observed chiefly in android pelvis and in flat pelvis with a backward sacrum. Posterior arrest low in the pelvis or with the head in sight was most common in anthropoid pelvis. For these cases the following maneuvers were used most successfully: the Scanzoni complete manual rotation and elevation and manual rotation.

Anterior arrests were observed most commonly in pelvis with an ample anteroposterior diameter and converging side wall with a decrease in the interspinous diameter. Delivery was accomplished by cephalic application of the forceps with downward traction.

Occasionally the outlet is narrowed by a forward curvature of the sacral tip. This favors arrest. Only by recognition of this feature can one work out the proper forceps maneuver in these cases.

Analysis of the cases in which stillbirth occurred (16 in 500) revealed that from the standpoint of pelvic shape the mechanism used to effect delivery was often at fault. Forceful attempts at anterior rotation in flat and android pelvis represented the common errors in mechanism. Another mistake was the forceful attempt at anterior rotation in low occipitoposterior arrest in extreme anthropoid pelvis. Numerous diagrams clarify the descriptions.

DANIEL G. MORTON, M.D.

Buschbeck H. Clinical Investigations Regarding the Therapeutic Use of Sex Hormones in Gynecology (Klinische Untersuchungen über die therapeutische Anwendung von Sexualhormonen in der Frauenheilkunde). *Ztsch f Geburt u Gyn* 1938 117 177.

The first part of the author's article is to be considered as an introduction to the later articles in which the experiences of the Würzburg clinic regarding sex hormone therapy and the indications will be discussed. Following a review of the development and extent of the hormone studies in the past the author emphasizes the discrepancy which exists between the results of the biological and the chemical investigations on the one hand and the clinical results obtainable in the human being. The reason for this discrepancy lies in the great difficulties which surround the practical application of hormonal therapy in gynecological practice. The practicing physician must be familiar with the hormonal relationships which govern the genital physiology of the woman in quantitative as well as in qualitative extent. Only then will he be able to set indications, choose the preparation, dose, form and interval of dose and only then will he be able to evaluate properly the result of his treatment with hormones. With the close relationship of all the secretions it

in a few minutes or in several days, but as the physiological changes in the lower uterine segment must continue, the bleeding will recur again and again

The placental attachment in the zone of dilatation and effacement results in pathological changes in the lower uterine segment. This portion of the uterus, in contrast to the upper segment, contains little muscle and much elastic tissue. It is the passive segment which serves as part of the passageway for the baby. The walls are thin but they are able to withstand much distention. The placental attachment results in a necessary extensive vascularization of this thin-walled lower segment (Fig 1), and this factor interferes with the integrity of this portion of the uterus. Moderate manipulations through the birth canal are likely to cause serious lacerations with their consequent profuse hemorrhage. This pathological lower uterine segment adds to the difficulties encountered in delivery through the birth canal.

The placental attachment in this abnormal site brings the placental site in close proximity to the lower genital tract, where bacteria are normally present. Also, vaginal manipulations must necessarily come in contact with this area, so that it is more vulnerable to both trauma and infection.

DIAGNOSIS

The diagnosis of placenta previa still rests on the findings at vaginal examination. The presence of placental tissue covering a part or all of the uterine os is diagnostic. The initial examination is usually made after the patient has been admitted to the hospital and after all preparations have been completed for the control of bleeding, the initiation of labor, and the combating of an unusual blood loss. The extent of the placenta previa is noted at this time. When the edge of the placenta is palpable at the margin of the os, the condition is designated as marginal, incomplete coverage of the os is designated as partial placenta previa, and complete coverage, as total placenta previa. The majority of patients at the present time are treated before the onset of labor so that the cervix is closed. The degree of placenta previa may change as the dilatation progresses but changing conditions do not influence the therapy. It is obvious that the term, central placenta previa, is no longer desirable, for this state can be determined only when dilatation is complete or at the time of cesarean section. The extent of placental coverage of the os at the time of the initial examination must determine the choice of treatment. The frequency of the several degrees of placenta previa differs little in the available statistical material.

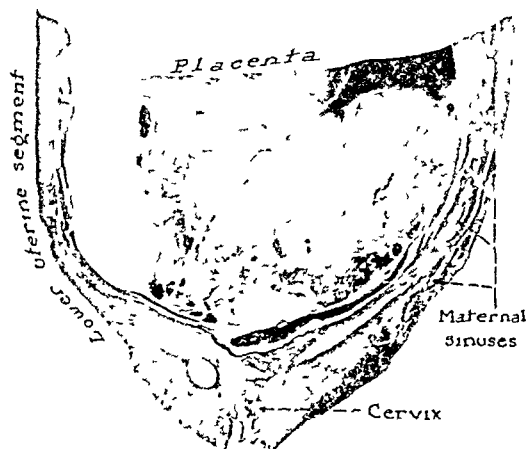


Fig 1 A section through the lower uterine segment and cervix in a case of total placenta previa. Note the pathological lower uterine segment. The extensive vascularization and increased thickness of the uterine wall are the results of the placental site in this abnormal locality.

In about one-third of the cases the entire os is covered by the placenta. Aldridge and Parks (3) reported that in their material marginal placenta previa occurred in 52.8 per cent, partial placenta previa in 19.5 per cent, and total placenta previa in 27.7 per cent. At The Chicago Lying-in Hospital Davis (21) reported a frequency of 52 per cent for the marginal variety, 13.2 per cent for the partial, and 34.8 per cent for the total coverage.

Ude, Weum, and Urner (79) in 1934 suggested a procedure for the diagnosis of placenta previa with x-rays and in 1935 (76, 77, 78) reported 35 cases in which this method was employed. Their method consists of visualization of the bladder by means of the injection of a radio-opaque substance so that the relationship between the bladder and the presenting part can be ascertained. Inasmuch as the lower uterine segment and bladder peritoneum are normally the only anatomical structures interposed between the bladder and the fetal presenting part, the intervening space should be about 1 cm. When the placenta is in the lower uterine segment its structure will be interposed between the lower uterine segment and the presenting part, and thereby decrease the proximity of the bladder. The technique is as follows: a catheter is inserted into the urinary bladder and after withdrawal of the urine, 40 c cm of a 12½ per cent solution of sodium iodide are injected. The catheter is removed and an anteroposterior film is taken with the tube centered over the lower

PLACENTA PREVIA, PRESENT-DAY TREATMENT

Collective Review

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THE literature on placenta previa published during the last five years indicates that a certain unanimity of opinion concerning treatment for this condition has developed. Whereas a decade ago many clinicians were still vigorously debating the virtue of cesarean section versus delivery through the natural passages, most authors now are in agreement that both these modes of therapy have their appropriate indications. The rational plan in which each case is individualized but in which basic principles are carefully followed offers the best results. More attention is now being directed to the hospitalization of all patients who bleed in the last trimester of pregnancy to the prompt diagnosis of the cause of this bleeding and to the necessary preparations for the control of bleeding and a safe termination of the gestation.

ETIOLOGY

In that the cause of placenta previa is not known there is no prophylactic treatment. Morton (59) in a careful anatomical study of a case of marginal placenta previa presents additional evidence that the cause of this complication may be due to a defective decidua high in the uterus and a relative abundance of decidua low in the uterus. The author believes that this condition may be the result of a pre-existing endometritis. This etiological explanation had much support in that period prior to the discovery of the cyclic activity on the part of the endometrium when 'endometritis' was a common pathological entity. Placenta previa is more logically the result of abnormal factors in the transportation of the fertilized ovum as a result of which the ovum reaches a locality near the internal os. Implantation and placentation in this vicinity must in variably result in which event all or part of the os will be covered by placenta. Until we learn all the factors in the normal transport of the ovum we cannot theorize concerning the abnormal factors.

Although the incidence of this complication has not changed materially it can no longer be re-

garded as a disease of multiparity. With a large families were the rule rather than the exception we were wont to associate multiparity and placenta previa. However, most of the recent reports indicate that the condition occurs with equal frequency in primiparas and multiparas. In a series of cases reported by Marr (54) 39 per cent of the patients were primiparas and 61 per cent multiparas. At The Chicago Lying in Hospital (21) the incidence was 35.1 and 64.9 per cent respectively. At the Sloane's Hospital the maximum number of cases occurred during the first pregnancy and at the Woman's Hospital (3) during the second pregnancy. Considering the average size of the present-day family placenta previa occurs with equal frequency in all gestations.

The bleeding in placenta previa is the result of physiological changes in the lower uterine segment incident to delivery. Some time in the last trimester of pregnancy a slow process begins in the cervix the ultimate goal of which is the conversion of the long uneffaced cervix into the lower uterine segment or passageway for the fetus. This process involves a slow obliteration of the long cervix and its canal. The onset of these physiological changes may begin early or late in the gestation. When the placenta is attached to the contractile portion of the uterus high in the uterine cavity its attachment is not disturbed by these changes. However when it is located in the region of the internal os the changes incident to cervical effacement must necessarily interfere with the placental attachment. As the lower uterine segment continues to be formed the rigid placenta is pulled away from its attachment which results in minute separation. These separations result in the repeated painless hemorrhages of placenta previa. It is thus evident that the time of onset of bleeding in placenta previa will vary in individual instances dependent on the physiological changes. The initial bleeding may occur before the period of viability of the fetus or it may be postponed until the onset of labor. That it will occur and recur is inevitable. Furthermore the amount of bleeding will vary with the size of the sinus that has been torn varying from a few drops to a profuse hemorrhage. The bleeding may cease

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control the bleeding and to replace the lost blood. Subcutaneous administration of normal saline or Ringer's solutions helps restore the depleted tissue fluids. The intravenous administration of hypertonic solutions such as glucose should be resorted to sparingly. For maintaining the blood volume, saline or Ringer's solution can be given by hypodermoclysis, with 16 gauge needles. Glucose solution in 20 per cent concentration should be given intravenously at as slow a rate as possible and should be discontinued just as soon as blood is available. No more than 600 c cm should be given unless a liberal blood transfusion follows. It must be remembered that large amounts of hypertonic glucose solutions draw liberally on the fluids in the tissues and increase the coagulation time of the blood. In the event that blood is not available immediately 500 to 1,000 c cm of 6 per cent acacia can be administered slowly intravenously. Although the blood volume be restored, sufficient circulating hemoglobin must be present to carry on the vital functions of life. The amount of the transfusions should depend on the blood loss, averaging from 600 to 800 c cm in the usual case. Dieckmann and Daily (24) report that in 22 cases in which the blood loss was measured it averaged 824 c cm, and that these patients received a total of 29 transfusions averaging 670 c cm of blood per patient.

The active treatment of placenta previa has changed considerably in the last decade. Some of the older methods have fallen into complete discard partly because of the dangers attending their application, but chiefly because of the introduction of newer methods which have furnished better results. Several of the procedures are still on trial awaiting more extensive experiences.

Tamponade of the vagina and lower uterine segment has fallen into complete discard in the therapy of placenta previa. It was introduced as a measure to control the bleeding at a time when other methods were not available. It most often fails to accomplish this end. It is almost impossible to pack the reproductive tract so securely that bleeding is controlled in a patient with placenta previa in the last trimester of pregnancy. In the home environment where this procedure was most often carried out, packing was even less successful. Furthermore, the introduction of a pack into the vagina definitely increases the hazards of infection. This complicating factor will interfere seriously with the choice of additional treatment necessary to deliver the patient, and thereby make a simple case complicated.

Patients who bleed in the home should be transported immediately without examination to a

hospital. In this age of good roads and rapid transportation the patient is subjected to no great danger in her removal to a hospital, provided she is not examined in the home. The patient with placenta previa is not likely to bleed profusely, if her condition is recognized early and no manipulations are attempted. The accumulation of blood clots in the lower uterine segment and vagina are more effective in controlling the bleeding from thin-walled sinuses than an improperly placed pack. A vaginal examination will disturb these clots and cause fresh bleeding which may be impossible to control in the home environment.

The simple rupture of the membranes provides the easiest and safest treatment in placenta previa. It is applicable in all patients with marginal placenta previa and in many patients with partial placenta previa. The procedure does not jeopardize any additional treatment that may have to be carried out as it should precede some of these methods. The rupture of the membranes allows the rigid placenta to recede with the receding lower uterine segment, and thereby put an end to further placental separation. It allows the presenting part to apply itself more firmly to the placenta and lower uterine segment, and thereby decrease the bleeding. Lastly, it is an effective means of initiating the onset of labor, especially, in patients in whom the cervix is effaced.

When simple rupture of the membrane does not suffice to control the bleeding, several measures are available. *Braxton Hick's version* is the oldest of these procedures, but it is rapidly being displaced by other methods. The technique of performing the version is not easy, particularly for the less experienced attendants. Even when dilatation is complete, providing ample room for the necessary manipulation, it is difficult to do a version. To change the polarity of the fetus through a partially dilated cervix, often long and incompletely effaced, in the presence of a placenta covering part of the os may be a formidable undertaking. Anesthesia to the surgical degree is necessary and the blood loss may be serious before the procedure is completed. The baby's body provides a good tampon so that bleeding is controlled usually after the completion of the version. The patient must go into active labor, complete the dilatation, and deliver the baby without undue traction. Any unusual force exerted in an attempt to hasten the normal processes will result in extensive lacerations. The abnormally vascularized lower uterine segment will not withstand rapid or forceful dilatation. These factors jeopardize the life of the fetus so that few babies are delivered alive. The high fetal mortality in Brax-

abdomen In the presence of central placenta previa there is a much wider separation than normal of the fetal head and bladder shadow while in partial placenta previa a wider separation is observed only on the side where the placenta is located These authors conclude that placenta previa can be diagnosed by means of a cystogram with a high degree of accuracy except in breech and transverse presentations

Beck and Light (7) in 1938 reported the use of this method in a series of patients who entered their clinics with a history of bleeding in the last trimester of pregnancy The diagnosis proved correct in 88.7 per cent of all the cases although the absence of placenta previa could be ascertained with a greater degree of accuracy than its presence The authors suggest that the roentgenological evidence of placenta previa is an aid in the diagnosis of this condition

More recently Snow and Rosensohn (75) injected air instead of sodium iodide into the bladder and obtained a very clean cut shadow which could be used to determine structural relationships in the pelvis Snow and Powell (74) were able to visualize the placenta under ideal conditions Neither the direct nor the indirect evidence offered by these methods is sufficiently accurate at the present time to warrant adoption of these methods as routine procedures on an obstetrical service A carefully conducted vaginal examination under ideal circumstances just prior to the institution of treatment does not add to the danger of infection It offers incontrovertible evidence of the presence and extent of placenta previa It provides information concerning the state of the cervix and the capacity of the birth canal It is the first step in whatever treatment is undertaken to terminate the gestation through the natural passages

It must not be forgotten that the history of painless bleeding in the last trimester of pregnancy is the most useful aid in the diagnosis of this important complication This symptom is so important that every prenatal patient should be apprised of its significance Every patient with painless bleeding in late gestation should be considered as a likely candidate for placenta previa and the diagnosis should be confirmed immediately by the examination of the patient in a hospital At The Chicago Lying in Hospital about 40 per cent of all women with painless bleeding late in pregnancy were found to have placenta previa on vaginal examination The other causes of painless bleeding at this period of gestation are of trivial importance and are easily ascertained during the examination They included erosions of

the cervix cervical polyps small vaginal varicosities small lacerations of the vaginal mucosa and urethral bleeding

TREATMENT

There are certain well-established principles in the treatment of placenta previa which have been accepted as essential by most of the large clinics These safeguards will decrease the hazards of this serious complication tremendously To disregard them may be a deliberate invitation to disaster It is obvious that it may not always be possible to carry them out in their entirety for the exigencies of the case may make special demands However the results obtained in large groups of patients prove their value

Every patient who has any vaginal bleeding in the last trimester of pregnancy should be referred to a hospital for diagnosis and treatment Some obstetrical emergencies can be managed safely in the home particularly when hospitalization is difficult or impossible though the value of hospitalization for obstetrical complications is becoming increasingly apparent There is no home therapy for patients who bleed late in pregnancy To undertake a vaginal examination in the home may result in the onset of such a profuse hemorrhage that immediate measures for the control of the bleeding must be instituted These cannot be carried out satisfactorily in the home environment so that the treatment of the patient becomes complicated or even desperate

After the patient enters a maternity preparations should be made to obtain suitable blood donors to establish the presence of placenta previa and to terminate the gestation if this diagnosis is confirmed Blood transfusion in the seriously exsanguinated patient is the most important adjunct to the active treatment The patient who has suffered a large blood loss before her admission should be given a transfusion before diagnosis or treatment is undertaken A suitable donor should be available until the patient is safely delivered These provisions are often life saving in character for only blood will replace circulating hemoglobin lost by the patient in a sufficient amount to endanger her life It is possible that stored blood will be made available to institutions in which it is difficult to accomplish transfusion Although great strides have been made in the technique of storing blood its use today is still in the experimental stage

Parenteral fluids are valuable in combating blood loss but do not replace blood in the seriously exsanguinated patient They help maintain the circulation while measures are being instituted to

in a patient who has already lost a considerable amount of blood. These disadvantages of metrorrhysis account for the considerable mortality associated with its use. However, viable babies are likely to fare better than if delivered by Willett's method or Braxton Hick's version.

The third stage of labor following delivery through the birth canal deserves special consideration. If no bleeding occurs following the birth of the baby, normal separation of the placenta can be awaited. The placenta should be expressed on its complete separation. In the event of bleeding, careful manual removal of the placenta is indicated. Invasion of the uterus immediately post partum is not without risk so that it should be done with the utmost regard for asepsis. After the removal of the placenta and blood clots, the lower uterine segment should be carefully explored to determine the presence and extent of trauma. Oxytocic drugs, such as pituitary extract administered intramuscularly or, better still, ergonovine intravenously, will usually produce good contraction of the corpus. However, bleeding may continue from the vessels in the placental site located in the lower segment. There is not sufficient musculature in this portion of the uterus to contract the vessels firmly. A uterine pack may thus become necessary. Tamponade should begin in the corporeal cavity, extend to the lower uterine segment and include the vagina. A poorly placed pack may do more harm than good for it may act as a plug sealing the vaginal orifice and allowing bleeding to continue behind it. Obvious cervical lacerations which bleed must be sutured. Complications of the third stage may add materially to the morbidity and mortality of placenta previa.

Cesarean section is a relatively new procedure in the therapy of placenta previa. In the last two decades its use has become widely extended and in the last decade well established indications for its application have been developed. It is probably the most useful procedure in this serious complication for it has made possible a safe method of delivery in patients with the most serious degree of placenta previa. Cesarean section has assumed as great an importance in the treatment of placenta previa as in cephalopelvic disproportion for it may be life-saving in both. A method with as much appeal as cesarean section is subject to much misuse. Unquestionably, many patients are subjected needlessly to a major operation. These patients could be delivered more safely by one of the other procedures previously described. The cesarean mortality is quite different than mortality in surgical procedures for it must often include the mortality of the several

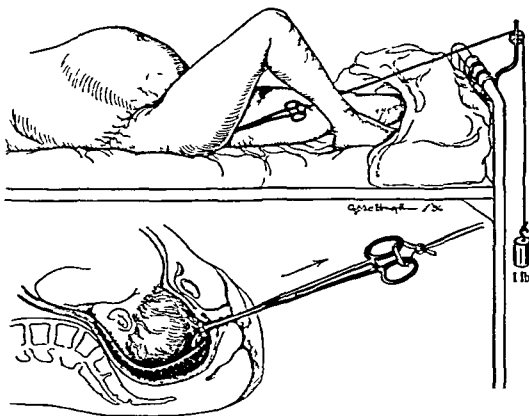


Fig. 2 Willett's method of providing traction on the fetal scalp in the treatment of placenta previa

cesareans which may have to be undertaken in the entire reproductive career of the woman. The performance of one cesarean operation generally necessitates a future cesarean section.

The indications for the use of cesarean section in the treatment of placenta previa are rather definite and in use in most of the representative clinics (9, 55, 12, 47, 72, 58). All patients in whom there is a complete coverage of the os by the placenta, unless they are in active labor and progressing, should be subjected to abdominal delivery. Most authors prefer cesarean delivery in patients with partial placenta previa who have a long, uneffaced and closed cervix. Such a procedure may be indicated even more when the condition manifests itself six or eight weeks before term, at a time when the induction of labor is likely to be prolonged and difficult. Patients who enter the hospital exsanguinated from a profuse hemorrhage may be considered candidates for abdominal delivery. Lastly, cesarean section may be considered in the first pregnancy of an occasional patient who is well along in years and to whom a living child is of great importance. There may be some other indication than placenta previa for the operation, such as cephalopelvic disproportion.

There are numerous advantages in abdominal delivery for major degrees of placenta previa. In the first place, delivery from below must necessarily take place through a pathological lower uterine segment. The most gentle manipulations and even natural delivery will traumatize the placental site to some degree. Trauma invites infection. Furthermore, the infection is introduced in the placental site which is the most vulnerable locality for its continuation and spread. Whenever inva-

ton Hick's (41, 20-21) version has led some clinics to limit this procedure to patients with previable fetuses so the baby can be disregarded.

Braxton Hick's version is rapidly losing popularity in most clinics. The technical difficulties of the procedure limit its use to trained attendants so that it rarely can be resorted to by the general practitioner when faced with a patient who is bleeding profusely. The pathological lower uterine segment to which the placenta is attached when subjected to careless manipulations through the vagina invites extensive lacerations with their concomitant blood loss and superimposed infection. These hazards result in a high maternal mortality not justified in the treatment of placenta previa.

Willitt introduced a method of treating placenta previa which has found widespread use on the continent and is gaining favor in this country (83, 1-21). Its value lies largely in its simplicity, which extends its usefulness to the general practitioner who still delivers the large majority of the babies. The method involves the use of the fetal head as an effective tampon against the placenta and thereby obviates the difficult Braxton Hick's version or the use of a hydrostatic bag. The procedure consists of first rupturing the membranes and then, under the guidance of the examining finger, a firm grasp is obtained on the fetal scalp by means of a specially designed long volsellum-like forceps. Moderate traction is then applied to the forceps so that the head maintains constant pressure against the placenta and lower uterine segment. The accompanying illustration demonstrates the principle of the method (Fig. 2).

When the bleeding is brought under control a spontaneous onset of labor is awaited. The patient should complete the dilatation without intervention following which the baby will be rapidly delivered. The lack of extensive manipulation because of the simplicity of this method has resulted in a low maternal mortality. Willitt's method is applicable in patients with partial placenta previa in whom simple rupture of the membranes does not suffice to control the bleeding. Until recently, this procedure was confined to patients with previable babies in whom the scalp injury could be disregarded. More recently viable infants have been delivered by this method for it was found that the scalp injury induced by the forceps was not serious and was not likely to lead to complications. Only moderate traction should be used, rarely more than 1 lb., in order to decrease the likelihood of scalp trauma.

Macurer in 1887 introduced *metreuryxis* in the treatment of placenta previa. The method en-

joyed considerable popularity until the last decade. It is still in use in a few of the large clinics but its popularity is rapidly waning because the dangers inherent in the procedure result in a considerable mortality. Theoretically it accomplishes the two prime prerequisites for any method to be useful in placenta previa: it controls the bleeding and it initiates labor. The collapsed rubber balloon is introduced intra-ovularly into the lower uterine segment after the membranes have been ruptured. The bag is then distended with fluid so that it provides constant pressure against the placenta. Moderate traction from 250 to 500 gm., on the stem of the bag will help maintain that pressure and will likewise provide an irritant to the uterus sufficient to initiate labor.

There are several practical objections to the use of the bag in the treatment of placenta previa. The introduction of a foreign body adds considerably to the danger of infection. This is true in any patient but when the placenta is located in the zone of dilatation and effacement this danger is enhanced. The pathological vascularized cervix which is so subject to damage (the close proximity of numerous vessels to the cervix and vagina where organisms are usually present and, lastly, the presence of old blood in the vagina definitely interfering with the normal biological mechanism present in the lower reproductive tract for the control of ascending infection) all contribute to the increased hazards of infection in the patient with placenta previa. This accounts for the fact that as many women die of infection as of exsanguination. There is no advantage in saving a woman from death as a result of blood loss to have her succumb ultimately to infection. Any method made use of in the therapy of placenta previa must not increase the hazards of infection.

The patient in whom a bag is introduced for the treatment of placenta previa must be carefully observed (18, 73). When the widest diameter of the cone has passed through the cervix the bag must be promptly removed. The colpo-uterus in the vagina does not continue to exert pressure against the placenta. It now occludes the vaginal orifice so that the bleeding which continues above the bag is not visible. A considerable amount of blood can accumulate in the lower uterine segment without the attendant being aware of the blood loss. This may be a serious hazard. When the bag is finally removed another major obstetrical procedure is usually necessary to deliver the baby. This must be undertaken whenever there is a recurrence of the hemorrhage and no appreciable progress. Version and extraction or forceps delivery may prove formidable operations

which is the one serious hazard to this method of delivery. Should the placenta be encountered on the anterior wall, the hemorrhage may be considered but it can be controlled readily, for the placental site is exposed to view. Packing usually controls the bleeding from the thin-walled sinuses and occasionally, if necessary, a bleeding vessel can be ligated directly. The trauma to the placental site produced by the clean-cut incision and its subsequent suture apparently does not add to the risk of infection. The low or cervical section can be carried out under local anesthesia, which may be an added advantage. The majority of the clinicians, therefore, prefer the lower-segment incision.

Vaginal cesarean section and accouchement forcé or rapid manual dilatation of the cervix have fortunately completely disappeared as methods of treatment in placenta previa. They are representatives of our darkest days in the therapy of this serious complication. The method of Delmas (23) probably belongs in the same category although its author recommends it highly. It consists of manual dilatation of the cervix under spinal anesthesia. Happily, the procedure is not used in this country.

PROGNOSIS

A statistical survey of the results of the treatment of placenta previa does not afford a true picture of this complication. It is obvious that results in large maternities with their experienced personnel would be vastly better than those which can be obtained in small general hospitals in which the obstetrical unit serves to all the practitioners in the community. Some cases are still treated in the homes particularly in rural communities and in these the results are considerably worse than those obtained in hospitals. Furthermore, many patients who enter some institutions have been manipulated seriously before their admission and have suffered considerable blood loss. These complicating conditions add considerably to the maternal and fetal morbidity and mortality. For these reasons statistics published by various authors are not comparable, but they do serve to evaluate treatment on a broad scale.

That progress has been made in the treatment of this complication is shown vividly by statistics from the same institution covering a period of years. Irving at the Boston Lying-in Hospital (41) reports for the years from 1924 to 1930 a maternal mortality of 11.6 per cent and a net fetal mortality of 16 per cent, for the years from 1930 to 1934, a maternal mortality of 2 per cent and a fetal mortality of 20.3 per cent. The Chicago Lying-in Hospital (21) reports for the years from 1927 to

1936, no maternal mortality and a net fetal mortality of 8.4 per cent in 190 cases of placenta previa. Siegel (72) at the University of Maryland reported for 115 cases treated prior to 1931 a maternal mortality of 5.22 per cent and a fetal mortality of 62.8 per cent, in 101 cases prior to 1933 the maternal mortality had been reduced to 0.99 per cent and the fetal mortality to 24.75 per cent. These few statistics point out vividly the marked improvement in the therapeutic results in the treatment of placenta previa.

The results obtained in the several methods of treatment vary considerably and again are not comparable. Although almost all clinicians consider simple rupture of the membranes as the safest procedure for the mother, nevertheless, this method is applicable only to patients who have marginal or a very moderate degree of partial placenta previa. These necessarily represent the mild and less serious cases. On the other hand, cesarean section is recommended almost unanimously for total placenta previa and for patients in whom the local findings make delivery through the natural passages a formidable and hazardous procedure. The results in cesarean section for all indications differ considerably in different institutions and are dependent on the environment and skill of the attendant as well as on the gravity of the complication for which the procedure is undertaken. Placenta previa does not add to the seriousness of cesarean section provided a proper choice of cases is made. Abdominal delivery in potentially or obviously infected cases results in a high morbidity and mortality.

The prognosis for the mother depends in a large measure on the efficiency of the entire management of bleeding in the last trimester of pregnancy rather than on the surgery undertaken to terminate the pregnancy. There is a surprising unanimity in our ideas. Early diagnosis is essential so that all patients must be examined in a hospital immediately after the first warning bleeding. Blood should be easily available before treatment is undertaken for blood transfusion is life-saving regardless of the choice of treatment. Pregnancy should be terminated when the diagnosis of placenta previa is confirmed regardless of the viability of the child. Irving (41), Davis (19, 20), and Danforth (18) believe that there is no expectant treatment for placenta previa when a diagnosis is established.

The prognosis for the baby is largely dependent on the duration of the gestation before the placenta previa first manifests itself. We have no control over this factor. The previable babies fail to survive regardless of the choice of therapy. The premature babies fare considerably better

sion of the reproductive tract takes place and this is almost always necessary the examining hand must come in contact with the placental site. The more complicated the delivery becomes the more frequent intravaginal manipulations are necessary the longer the labor the poorer the environment and the more inevitable is the increase in the hazards and subsequent infection.

Abdominal delivery obviates most of the manipulations through the pathological lower uterine segment. It decreases the possibility of carrying infection from the lower genital tract to the placental site and uterine cavity. It spares the placental site unusual trauma. The rapidity of the procedure necessarily decreases the blood loss as well as the likelihood of infection for these two hazards go hand in hand. The treatment of the third stage always a serious concern in delivery through the natural passages is simplified and made safer. Lastly the chances of survival on the part of the baby are vastly improved by cesarean delivery as shown in all statistical reports. Any method of delivery through the birth canal must consider invariably the interests of the baby secondary to those of the mother. No procedure to safeguard the baby must be undertaken which adds materially to the maternal hazards. The lives of many babies thus are lost necessarily. Abdominal delivery safeguards the interests of most viable babies. Many premature babies who would lose their lives in more difficult and time consuming deliveries from below survive this gentle method of delivery.

Cesarean section in the treatment of placenta previa is not without serious dangers. Infection is still the most frequent complication which accounts for the high morbidity and mortality. The incidence of infection following cesarean is greater when it has been performed for placenta previa than for other major complications. This is probably due to several factors. In the first place there is the close proximity of the placental site to the vaginal canal which normally harbors bacteria some of which may be virulent. Secondly the presence of blood in the vagina over a period of several days increases the number of virulent organisms. Blood serum is the ideal pabulum to nurture virulent bacteria which are present in the vagina or have gained admission to it by examination. Lastly the presence of necrotic blood cells and serum in the vaginal canal alters the biological mechanism of the lower genital tract which normally acts as a barrier to infection.

The dangers from postoperative infection can be decreased. Only clean patients should be subjected to a cesarean section. The patient who

has been examined in the home the patient who has been packed the patient who has obvious evidence of infection in the form of temperature or a foul vaginal discharge must be delivered from below. Porro section in which the uterus is removed following delivery of the baby is being advocated by an increasing number of clinicians for the potentially and obviously infected cases in whom the reproductive function can be sacrificed. Although this procedure is a formidable operation nevertheless it does reduce the hazards of infection. This is accomplished by the removal of the uterus, which may serve as a focus for serious or fatal sepsis. It is undoubtedly of value in infected patients who cannot be delivered through the birth canal by simple measures.

The dangers from postoperative infection can be decreased by the prompt recognition of the presence of placenta previa after the first warning bleeding. This requires co-operation on the part of the patient and her physician. Continued hemorrhages increase the hazards of infection. There is a definite relationship between the mortality of placenta previa and the length of time that has intervened from the warning bleeding to the termination of her pregnancy.

A few women die of hemorrhage following delivery by cesarean section. This complication is most often avoidable. Careful operative technique in which good hemostasis is obtained if necessary by suture of thin walled uterine sinuses in the placental site will diminish the possibility of bleeding. Usually an intra uterine pack suffices to control this hemorrhage. Patients who enter an institution in an exsanguinated condition should be fortified by a liberal transfusion before any treatment is undertaken. The patient who has suffered a considerable blood loss during the operation should be given a transfusion immediately after its completion. These safeguards will minimize the danger from hemorrhage.

Both methods of abdominal delivery have certain advantages in the treatment of placenta previa. The adherents of the classical cesarean section maintain that this procedure usually avoids the placental site and placenta and thus provides an easy access to the uterine cavity. This is true particularly if the placenta is on the anterior wall of the lower uterine segment. The hemorrhage from such a corporeal incision will be easily controlled and moderate in amount. Proponents of the low or cervical cesarean operation feel that the added safety provided by this procedure more than compensates for the difficulties which may be encountered. The lower segment operation provides increased safety from infection,

OBSTETRICS

LABOR AND ITS COMPLICATIONS

Jeffcoate, T N A · Uterine Inertia *J Obst & Gynaec Brit Emp*, 1938, 45 893

The nature of uterine contractions and the progress of cervical dilatation are largely dependent on the relation between the passenger and the passages. In the absence of mechanical faults in this relation, however, endocrinous factors are of considerable importance in determination of the behavior of the uterus. They are not only of first concern in the preparation of the uterus during pregnancy, but are also responsible for the onset and maintenance of expulsive uterine contractions. Inertia which is not the result of a mechanical obstacle to delivery may, therefore, be caused by a relative insufficiency of activating principles, such as estrogenic hormone and possibly oxytocin from the posterior lobe of the pituitary gland. Of these the estrogenic hormone is the more important.

The effects of estrogenic principles on uterine muscle may be summarized as follows (1) increased vascularity, (2) increased metabolism and oxygen consumption, (3) hypertrophy of muscle, also limitation of the growth of muscle which ordinarily results from the presence of a foreign body in the uterus, (4) increase in tone and spontaneous contraction, (5) increased sensitivity to oxytocic agents, (6) co-ordination of uterine contractions, and (7) indirect stimulation by effecting the secretion of oxytocin from the posterior lobe of the pituitary gland (doubtful).

In view of the above considerations a clinical investigation into the effect of estrogenic hormone on patients suffering from uterine inertia in labor was carried out. The use of estrogenic hormone should not be regarded in any light other than as an accessory measure. Morphine and other sedatives take first place in the treatment of uterine inertia, the use of the forceps is sometimes essential, and cesarean section may be indicated in special circumstances. When operative intervention is necessary, however, spinal or local anesthesia is preferable to inhalation anesthesia if post-partum hemorrhage is to be avoided.

Estrogenic hormone should be used in those patients in whom uterine action is not improved by sedatives and antispasmodics. It not only enhances the power of uterine contractions but also serves to regulate and co-ordinate them, and this latter effect is of the utmost importance. It is especially useful in the prophylactic treatment of inertia.

Eighty-eight patients were treated, only 16 of them had been in labor less than twenty-four hours when treatment was commenced. The average duration of labor before the first injection was forty-five and eight-tenths hours. The treatment was successful in 50 (56.8 per cent), labor being completed

spontaneously in 27 of these (54 per cent). Excluding those patients ultimately delivered by cesarean section, the average duration of labor after the commencement of treatment was nine and one-half hours. In 34 patients (38.6 per cent) the treatment failed. In these the average duration of labor after the first injection of estrogenic hormone was twenty-seven and two-tenths hours. Only 11 patients (32.3 per cent) were delivered spontaneously.

The estrogenic principles in circulation during pregnancy are mostly in an inactive state. This suggests the existence of some mechanism which is protective insofar that the hormone is prevented from sensitizing the uterus prematurely. If such a conception is true it may be that some cases of inertia are due to a persistence of this mechanism and any estrogenic hormone administered will be inactivated and rendered useless.

CHARLES BARON, M D

DeNormandie, R L. Cesarean Section in Massachusetts in 1937. *New England J Med*, 1938, 219 871.

The Section of Obstetrics and Gynecology of the Massachusetts Medical Society with the consent and aid of the Massachusetts Department of Public Health made a study of the incidence of cesarean section in the State by questionnaires sent to all the licensed lying-in hospitals. The questionnaire covered the important points of interest pertaining to cesarean section, such as indications, types, obstetrical conditions, mortality, and whether the procedure was elective or due to an emergency.

One hundred and seventy-one hospitals received questionnaires. Thirty-seven had no cesarean sections during 1937, 133 answered the questionnaires, and 1, a small unapproved hospital, failed to reply.

There were a total of 63,988 births in Massachusetts for the year 1937, 48,966 of these occurred in hospitals. There were 2,082 cesarean sections and 24 hysterotomies, an incidence of 1 in 30.3 births. One thousand one hundred and seventy-eight were elective, 872 emergency, 1,112 were low, and 870 classical. The Latzkos type was performed in 19 cases, the Porros in 21, pentoneal exclusion in 1 case, and the type was not reported in 59 cases. One thousand three hundred and thirty-three patients were not in labor and 681 were in labor, 1,697 had unruptured membranes, and 296 had ruptured membranes. Fourteen different types or combinations of anesthesia were reported, nitrous oxide, oxygen, and ether combinations leading the list with 1,357 cases, in 14 cases the anesthesia was not reported. The remainder of the anesthetics were obtained with practically all known anesthetic drugs, alone or in combination with one or more of the others. There were only 5 cases with ethylene anesthesia.

when delivered by cesarean section. Abdominal delivery offers the best prognosis to the entire group of babies for the hazards of delivery through the natural passages cannot always be predicted. Thus when the fate of the offspring becomes a major consideration this added factor may determine largely the choice of therapy. Representative groups of statistics indicate that the gross fetal mortality in cesarean section averages 15 per cent whereas delivery from below doubles and very often triples this risk.

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A physician in the Department of Public Health examines all death certificates. When one is found that in any way relates to pregnancy the committee, which has been appointed from the Section of Obstetrics and Gynecology, is notified, and its investigator makes arrangements to visit the physician whose name appears on the death certificate, but not until after the Department of Public Health has notified the signer, by letter, that such an interview is authorized. All this is accomplished as rapidly as possible so that the attending physician will have his facts fresh in mind. A questionnaire of important details is filled out on each case.

The mortality rate for 1937 was 4.1 per 1,000 or 0.41 per cent. Sepsis headed the list with 112 cases, and 13 other causes were listed for the remainder. Medical complications were listed as second in number with 57 cases. Embolus accounted for 34 deaths and hemorrhage for 30. Of the cases of sepsis, 41 were due to induced abortion, 21 of the patients died after normal delivery, but many of these had inadequate or no prenatal care. Practically all of the septic deaths followed some form of operative interference.

In the group listed "medical complications," pneumonia accounted for 20. These cases were well handled. There was no interruption of pregnancy because of the respiratory infection. Twenty patients died from cardiac disease, many of these received inadequate or no prenatal care. Mitral stenosis was the predominating heart lesion. A high incidence of operative interference on decompensated patients occurred. Nephritis accounted for 7 deaths and 10 other causes for the remainder of the 57.

The committee believes embolism was the cause of death in the 34 cases in which such a diagnosis was made.

Sixteen of the 30 patients who died from hemorrhage died after delivery, 7 had placenta previa, and 7 ablatio placenta. There were 29 deaths from albuminuria and eclampsia. Many of these women consulted a physician, were advised of their condition, and urged to return but did not. The committee believes it is the doctor's duty to follow up such cases by letter, emphasizing the danger of neglect. It is also mentioned that the medical attendant failed to induce labor in some cases in which the patient did not respond to conservative measures.

Under accidents of labor, rupture of the uterus was reported 9 times. In many of these cases accouchement forcé was practiced. Two cases are listed under "spontaneous" delivery and 2 under inversion of the uterus, in the latter 2 cases no criticism was made of the management of the third stage.

Eleven deaths were listed as due to surgical complications, 9 to abortion, not septic, 6 of the latter to hemorrhage. The rôle of transfusion is stressed. Six deaths were attributable to anesthesia, the agent was ether in all cases.

Six deaths resulted from ectopic pregnancy. Three of the patients were in a state of collapse when first seen by the physician, 1 was in "severe shock," 1 in "profound shock," and 1 was described as "critical." The last mentioned patient received a transfusion before operation. It is again stated here that treatment of shock, and transfusion, should precede operation in such cases.

Four deaths occurred from pernicious vomiting, and 3 from transfusion. Shock and sudden death account for the last 4.

This study is to continue for four years more.

CHESTER C. DOHERTY, M.D.

One hundred and ninety two babies died. In 7 cases cesarean section was done when the baby was dead and macerated. Three cesarean sections were done on patients in whom the babies were known to be hydrocephalic.

Convalescence was noted as uneventful in the majority of the cases but such complications as phlebitis distention pulmonary embolus wound suppuration and upper respiratory infection were recorded.

Five hundred and seventy six of the 2082 patients operated upon had had previous cesarean sections. In 539 the indication was contracted pelvis. So many of the operations were performed by general surgeons that a clear idea of the necessity of cesarean section on account of actual disproportion cannot be determined. Placenta previa was the indication in 183 cases and toxemia in 123. The remainder were included under 44 other indications one of which was termed bizarre by the author. Under this latter heading are found the indications 55 in all which no other word would describe quite so well.

There were 66 maternal deaths a mortality rate of 3.1 per cent. Fifty one followed emergency and 15 elective cesarean section. The low and classical types of section had the same mortality 9 each however with 1112 being low and 870 classical the mortality for the low operation is somewhat less than for the latter. Twenty-eight deaths were attributed to sepsis the remainder were attributed to 15 other causes. CHESTER C. DOWNEY, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Chimentì A. Morbidity and Mortality Due to Puerperal Infection (*Considerazione sulla morbidità e mortalità da infezione puerperale*). *Rivista di ginec.* 1938 21 461.

The reports presented at the 1936 Congress of Milan have shown that the maternal mortality due to puerperal infection has remained the same for several years notwithstanding continuous efforts to and its reduction through propaganda and the provision of adequate obstetrical assistance. Nevertheless the emphasis has been placed on the possibility of further improvement although the percentage of mortality remains within relatively low limits. It has also been found that this mortality is lower in some southern parts of Italy which are less well provided with adequate obstetrical assistance than the northern parts. Various explanations have been given for this discrepancy such as the differences in climate the evolution of obstetrical service and the number of criminal abortions. Undoubtedly the problem of mortality due to puerperal infection is very complex but the author found from a review of 8057 cases admitted to the Clinic of Bari between 1925 and 1936 that results are most satisfactory when the woman is brought to the Clinic at the beginning of labor before any vaginal examination has been made at home.

The material studied includes 4159 cases admitted after spontaneous delivery 1599 after operative delivery 615 after spontaneous abortion and 1693 after operative abortion. Analysis shows that a morbidity of 26.6 per cent occurred among the cases with spontaneous delivery at home. The frequency of septic complications in these cases was 50 per cent while it was only 6.7 per cent among those delivered at the Clinic. A mortality of 7 per cent occurred among the febrile cases after spontaneous delivery at home while it amounted to 1.1 per cent among the febrile cases after delivery at the Clinic (3.1 per cent in primiparas and 5.3 per cent in multiparas) as to those patients delivered at the Clinic it is to be noted that labor had started at home.

In the group of operative deliveries the morbidity was 51 per cent and the mortality in the febrile cases 4.2 per cent (2.4 per cent in primiparas and 6 per cent in multiparas). Among the factors which predispose to a fatal course are to be noted especially the unsuccessful attempts at surgical intervention made in the home fever during labor at the time of admission and tamponing done in the home for metrorrhagia due to placenta previa.

In the group of spontaneous abortions the morbidity amounted to 14 per cent. In the group of operative abortions the morbidity amounted to 14 per cent also but the percentage of decidedly febrile cases was twice that of the former group and the mortality ran to 4 per thousand of the total number of abortions practically all these deaths followed criminal abortion.

A comparison of some of the percentages given by the Clinic of Milan with those obtained at the Clinic of Bari makes it appear probable that the large number of deaths due to sepsis after abortion is one of the principal causes of the higher mortality due to puerperal infection in northern Italy than in southern Italy. In the Clinic of Milan there were 35 deaths due to post-abortion sepsis among 100 deaths from puerperal infection and in the Clinic of Bari the figure was only 13. As the majority of deaths resulting from sepsis are to be attributed to improper obstetrical assistance in the home the conclusion is justified that a further decrease in the percentage of mortality can be obtained especially in the country district and particularly in southern Italy if a correctly organized obstetrical assistance is made available. RICHARD KEMEL, M.D.

MISCELLANEOUS

Heffernan R. J. The Maternal Mortality Study in Massachusetts for 1937. *New England J. Med.* 1938 2 9 865.

A study of all deaths associated in any way with pregnancy over a five year period from 1937 to 1941 has been started by the Division of Child Hygiene of the Massachusetts Department of Public Health in conjunction with the Section of Obstetrics and Gynecology of the Massachusetts Medical Society.

nized clinically or at autopsy, were in patients under fifty years of age. Unilateral fused kidneys are predisposed to hydronephrosis and pyelonephritis, but not to other renal lesions. Such surgery as was done on these kidneys was for relief of obstruction or infection.

The most common symptom is pain, and the renal mass is usually palpable, especially if it is the site of a complicating lesion. Frequently there are urinary symptoms. The diagnosis can be easily and accurately made by pyelography, which shows the ureter of the ectopic kidney crossing the midline to terminate in the bladder normally, a "triangle" pyelogram being presented.

ARTHUR H. MILBERT, M.D.

Eichelberger, L. Experimental Hydronephrosis in Dogs. I. The Composition of Blood Serum. *J. Urol.*, 1938, 40, 366.

Fourteen normal dogs were used by the author in his experiment to produce a hydronephrosis by means of partial constriction of a ureter and a contralateral nephrectomy. Chemical studies of deviations in the composition of blood serum, and pyelographic studies of the progress of the hydronephrosis were made. The animals with experimental hydronephrosis were classified into two groups: the chronic, in which approximately 50 per cent of the renal tissue was destroyed, and the progressive, in which the greater part of the renal tissue was destroyed. Chemical studies of the blood serum in the chronic group showed no significant deviation from the normal. In the progressive group, significant changes were found in the uremic stage. These changes were a marked acidosis, retention of non-protein nitrogen constituents, and increased calcium and inorganic phosphorus concentrations, unaccompanied by any change in the total protein concentration, but accompanied by an increased albumen/globulin ratio.

D. E. MURRAY, M.D.

Secrétan, M. The Value of Chromocystoscopy in the Diagnosis and Localization of Renal Tuberculosis (La valeur de la chromo-cystoscopie dans le diagnostic de localisation de la tuberculose rénale). *J. d'Urol. med. et chir.*, 1938, 46, 201.

Chromocystoscopy was devised by Voelcker and Joseph more than thirty years ago. It is most widely practiced in German-speaking countries, where 32 out of 33 clinics report its use. The method consists in the intramuscular or intravenous injection of indigo carmine. In the normal subject the dye appears within several minutes at both ureteral orifices in the form of dark blue ejaculations. From the time of appearance and depth of the color one can estimate the renal function on either side. An evaluation of the variation in color requires considerable experience. The method has the advantage of being physiological and does not require ureteral catheterization nor involve the reflex changes in the kidney dependent thereon. It requires only fifteen or twenty minutes. By catheteri-

zation of the ureters, however, separation of the urines may be obtained. In cases of renal tuberculosis complicated by vesical tuberculosis, one may determine which kidney is involved without subjecting the healthy kidney to the risk of infection from below by catheterization. Good elimination does not guarantee the anatomical integrity of a kidney, however, since a kidney may sometimes have a small tuberculous lesion and the remainder of the parenchyma exert a compensatory hyperfunction.

Factors favoring a poor elimination of indigo carmine are:

1. Intramuscular injection, after which the dye normally appears in from five to twelve minutes, reaching a maximal intensity in from twenty to forty-five minutes. After intravenous injection the dye usually appears within two minutes and reaches its maximal intensity in from three to five minutes. Although reactions are more common with intravenous injection, the author prefers it, using 4 c.c. of a 0.4 per cent aqueous solution freshly prepared from tablets.

2. Fasting, purging, and forcing of fluids.

3. Marked alkalinity of the urine, which may cause the excretion of the dye as a colorless chromogene. This is exceptional in cases of renal tuberculosis.

4. Various renal conditions other than tuberculosis, such as nephritis, lithiasis, and tumors.

5. Circulatory, nervous, and toxic factors, such as cardiac decompensation, narcosis, spinal anesthesia, and cachexia.

6. Mechanical factors, such as ureteral spasm or retention of the dye in an enlarged renal pelvis. A factor favoring the good elimination of indigo carmine is the presence of tuberculous lesions of minimal extent. These are quite deceptive since they frequently cause a compensatory hyperfunction of the rest of the kidney.

One hundred cases of renal tuberculosis were studied as completely as possible by means of chromocystoscopy, intravenous or retrograde pyelography, separation of urines, guinea-pig inoculations, and correlation with operative and autopsy findings. In 56 cases of unilateral renal tuberculosis, 53 of the diseased kidneys showed a poor excretion, and 3 showed a normal excretion. In this same group 44 of the healthy kidneys showed a normal excretion and 12 showed a diminished function. The percentage of diseased kidneys accurately diagnosed was 95 per cent, of the sound kidneys, 78 per cent. In 44 cases of bilateral renal tuberculosis, the more involved side showed an impaired function in 43 cases and a normal function in 1 case. In the same group, the less involved kidney showed an impaired function in 22 cases and a normal function in 22 cases. Thus for bilateral renal tuberculosis the percentage of accurate diagnoses for the more involved side was 98 per cent, and for the less involved side only 50 per cent.

AUGUST JONES, JR., M.D.

GENITO-URINARY SURGERY

ADRENAL KIDNEY AND URETER

MacKenzie D W and McEachern D Tumor of Medulla of Adrenal (Adrenal Pheochromocytoma) with Removal and Relief of Paroxysmal Hypertension *J Urol* 1938 40 467

The authors report a case of adrenal pheochromocytoma. The patient presented a typical history of attacks which varied greatly in severity some being exceedingly mild and others very severe though always of a similar nature. The first warning was a feeling of suffocation behind the sternum and the sensation of a slowing up and overworking of the heart but without real palpitation or a feeling of cardiac irregularity. The patient's pulse during an attack was found to be 60 beats per minute and regular. A few seconds after the onset of sensation in the chest his face would become blanched which was obvious even to himself when he looked in the mirror. There was no cyanosis. At the height of an attack which usually continued for several minutes he had a mild throbbing headache deep behind both frontal regions. In addition there was severe pain above the left eye which quickly disappeared as soon as the attack began to subside. The pain was always in this same location. The patient had had no previous injury in this region. When the attacks were severe there was numbness of the fingers then of the hands and if the condition was prolonged the numbness extended upward as high as the elbows. There was a greater tendency toward numbness on the left side than on the right so that when numbness was present up to the elbow on the left side it extended only up to the wrist on the right. The feet became cold and occasionally numb the left foot being affected more than the right. On some occasions if the patient had food in his stomach he vomited. There was no desire to defecate nor were there rumblings of the gut or any eructation of gas. However there was invariably a desire to urinate although this could always be controlled. There was no sweating during the attack but after it had passed away the patient felt more damp than usual and the skin was warmer although there was no actual flush. There was never any disturbance of consciousness at any time and he knew and remembered everything that was going on. The attacks lasted from one to five minutes according to their severity. Tinnitus and blurring of vision occurred rarely. Although some attacks occurred without apparent cause certain factors were found to be associated with them.

Activity and change of posture especially bending or torsion of the trunk were the most common factors precipitating the attacks. They were more frequent and severe after fasting and were relieved by nourishment. Sometimes the attacks were precipitated by emotional upset.

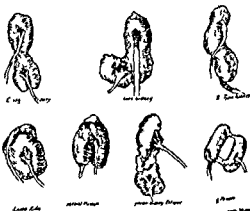
It became apparent that each attack was associated with a marked rise of blood pressure the degree of rise paralleling the severity of the attack. Many attacks were registered over a period of seven days the highest spontaneous elevation of blood pressure being 245/172. The patient classified this as a medium attack and therefore his blood pressure had undoubtedly risen even higher in some previous attacks. Between attacks the blood pressure was invariably about 120/80.

A complete urological study failed to locate the site of the tumor. The authors therefore decided to operate on the left side but no tumor was found. The right suprarenal area was then exposed and a tumor was found and removed. Immediately after operation the blood pressure dropped and the tremor of the hands which had persisted for many years disappeared. J. STOKES RITTER M.D.

Wilmer H A. Unilateral Fused Kidney. A Report of 5 Cases and a Review of the Literature. *J Urol* 1938 40 557.

Unilateral fused kidney is a term used to describe the rather rare congenital renal anomaly in which both kidneys are fused on one side of the midline. Crossed ectopia with fusion and crossed dysplasia with fusion are other descriptive terms for the lesion. Five cases are reported together with a series of 94 cases collected from the literature which brings the total number of reported cases of the anomaly to 286.

The anomaly falls into six types: (1) elongated, (2) S shaped, (3) L-shaped, (4) mesial border fusion, (5) lump and (6) superior ectopic kidney. The condition is found approximately once in 7,500 autopsies. In about 60 per cent of the cases the kidneys are found on the right side. Sex distribution is about equal and the majority of cases either recog-



It must be kept in mind when treating staphylococcus stones that the staphylococcal infection is the most important cause of the lithiasis, for which reason fighting the infection is very essential as a prophylaxis against the formation of stones, but, on the other hand, it is impossible as a rule to prevail over the staphylococci unless all the stones pass spontaneously or are removed operatively. An injection of neosalvarsan before the operation makes the urine sterile, which is probably not without importance for the prognosis.

Given in from 1 to 3 injections of from 0.15 to 0.30 gm. at intervals of a few days, neosalvarsan often has an excellent result. Most cases of non-complicated staphylococcuria can be healed with this agent. However, in many cases the effect is incomplete or transient. This may be due to the presence of concretions in the urinary passages or to other complications, especially prostatitis. In such cases increased doses of neosalvarsan should be given as well as other treatment suitable for the prostatitis. Lately the author has frequently used sulfanilamide preparations, such as prontosil, streptomycin, and proseptamin, in cases of urinary infections. They often work well against staphylococci, but usually not so well against streptococci and bacilli.

As known, marked acidification of the urine through diet, calcium and ammonium chloride, and amygdalic acid, is an excellent measure against colon infections. It has but slight effect on the staphylococci themselves, but it may be suitable to make the urine strongly acid for other reasons. Vaccine and bacteriophage therapy have no effect in staphylococcuria. Finally, treatment of any source of infection is of importance. As mentioned previously, the most common source is prostatitis and, less often, tonsillitis, tooth infections, and the like.

However, there are other means which are prophylactic and which may, moreover, act favorably upon already formed stones. To these belong primarily the agents just mentioned for making the urine strongly acid. The staphylococcus stones are composed of alkali salts and the capacity of the staphylococci to decompose the urea and thereby create a favorable urine reaction for the precipitation of these salts is a very important cause of the lithiasis in staphylococcuria. A strongly acid urine should therefore prevent the precipitation of alkali salts and perhaps dissolve those already formed. A good way to produce these results should be to irrigate the renal pelvis with acid solutions such as 1 per cent phosphoric acid or the previously mentioned solution of potassium permanganate and boric acid. There is much to indicate that vitamins play a part in lithiasis, especially a deficiency in Vitamin A. However, the significance of vitamins in urinary lithiasis in humans is still too obscure to allow any far-reaching etiological or therapeutic conclusions.

As we know, the chances of bringing about spontaneous discharge are greatest when the stone

is situated in the ureter. It is of the greatest importance to know how long one dares to wait for the spontaneous passage of staphylococcus stones in the ureter. It is usually possible to wait quite a long time, up to several months. Of course, one should not go too far with expectant therapy in staphylococcus stones in the ureter, and it is better to operate upon the doubtful case. It should not be forgotten, however, that operation does not need to be done immediately as a rule, there is usually plenty of time to wait and give the situation due thought.

To summarize, probably most urinary infections can in some way or another contribute to the appearance and development of concretions, but infection with staphylococci is the most important in this respect since it is the most common cause of infection stones and produces a uniform type of concretion.

HARRY W. FLAGGEMLYER, M.D.

Bravetta, G. Remote End-Results of Treatment for Ureteral and Renal Calculi (Contributo alla conoscenza degli esiti remoti degli interventi per calcolosi renale e ureterale) *Arch. ital. di urol.*, 1938, 15, 305.

The author reports a detailed study of 112 individuals in whom intervention was necessary because of ureteral or renal calculi, particular reference is made to the end-results. The danger of late complications seems present no matter what form of treatment is used, whether conservative or radical. The indications are that our present methods of treating these disorders are not efficient. Whether pyelotomy or nephrotomy is done (the procedure depending upon the indications), it seems to make little difference in the end-results. Although sepsis and stricture with dilatation seem to favor the development of recurrences, they alone are not the complete answer to the problem.

A. LOUIS ROSE, M.D.

BLADDER, URETHRA, AND PENIS

Caporale, L. Endoscopic Study of Emptying of the Bladder. A New Personal Method of Examination in Urological and Gynecological Diagnosis (Lo studio endoscopico del vuotamento vescicale. Nuovo metodo personale d'indagine nella diagnostica urologica-ginecologica) *Arch. ital. di urol.*, 1938, 15, 473.

In the endoscopic study of emptying of the bladder, Caporale uses McCarthy's urethrocystoscope, fills the bladder with antiseptic solution, and, after examination of the interior of the bladder, allows the solution to escape while he continues his observation. As the solution escapes in the normal subject the following is noted: a progressive reduction of the various diameters of the bladder with the formation of folds running in various directions on the mucosa, except over the area of the trigone, an accentuation of the usual arc of the interureteral ligament convex toward the neck of the bladder, a clearer appearance of the ureteral orifices, which come more closely to-

Hellstrom J. The Significance of Staphylococci in the Development and Treatment of Renal and Ureteral Stones. *Brit J Urol* 1935 10 348

The attempt to find a common etiology for all forms of lithiasis can hardly be said to have led to any definite result. A distinction must be made between the concretum formation as a physico-chemical process and the factors which release this process. Explaining the concretum formation as for example a colloidal-stallion precipitation is of little help as long as we do not know what brings it about in a given case.

Distinction has long been made between the so-called an *epithelial stone* and *infection stones* it being generally assumed that the former develop without bacterial action and that in the case of the latter the infection in the urinary passages plays the most important part in the lithiasis.

According to general experience it is especially infections with urea-splitting bacteria particularly staphylococci and proteus bacilli which lead to lithiasis in the urinary passages while if colon bacilli are accorded any importance at all in this respect it is said to be subordinate or secondary. Examination of the organic substance in the stones has been able to show that they developed because of a primary staphylococcal infection and that the colon bacilli appeared secondarily which is a fairly common occurrence.

An investigation of 750 cases of kidney and ureteral stones which were taken care of in Stockholm showed them to be distributed as follows:

| | |
|---------------------------------------|-------------|
| Oxalate or oxalate phosphate stone | 63 per cent |
| Uric acid or urate stones | 5 |
| Hydroxide stones an <i>epithelial</i> | 5 |
| Infection stones | 2 |
| Uncertain cystin stones | 5 |

A closer analysis of the infection stones reveals that at least 75 per cent were caused by staphylococci.

The following types of staphylococcal stones may be found:

1. Very slowly growing hard stones which never become very large and which occur singly or in pairs.
2. Rapidly growing small porous stones which are passed spontaneously and recur easily.
3. Slowly but continuously growing stones which can develop into the large hard coral type.
4. Rapidly growing rather loose stones often multiple and quite large and not infrequently recurred after operation.

A spontaneous passage of stones was observed in 62 per cent of the case.

In over 70 per cent of the men gonorrhea preceded the appearance of staphylococcal and the symptoms of stone undoubtedly the chronic staphylococcal is in many cases a postgonorrheal infection and is maintained by such postgonorrheal changes as prostatic prostatitis, stricture and salpingitis but in a large number of cases a preceding gonorrhea may be excluded. Staphylococcal stones may arise from different sources if in

fection especially the mucous membranes in the upper air passages and is maintained by chronic infection in the kidneys and urinary passage.

In the majority of cases the urinary sediment contains masses of bacteria sometimes only a few and occasionally none at all. It is worthy of note that in most cases the residual nitrogen lay within normal limits which indicates to a certain degree that the renal parenchyma is but slightly attacked in these infections.

In order to determine whether there were any signs of hyperparathyroidism in the cases of often very intensive lithiasis a number of blood calcium estimations were done but all showed normal values. Nor did examination of the gastric juice which through changing the reaction of the urine might play a part in the formation of concretions show any deviation from the normal.

Roentgen examination in the case of staphylococcal stones does not differ essentially from that in stones in general. Since staphylococcal stones are rich in calcium salts they generally show up well in the roentgen pictures. It is worthy of note however that these stones often contain much organic matter as well as triple phosphate which give a poor roentgen shadow. This may explain why despite typical symptoms of calculus and the presence of concretions stones do not always appear in a common roentgen picture. An intravenous or retrograde ureteropyelography however should decide the diagnosis in these cases.

The presence of concretions should be a pointer in every case of staphylococcal stones.

All stones even an *epithelial* are known to be able to produce pathological anatomical changes in the kidneys and urinary passages especially in the form of dilatation. It is obvious that they will maintain and aggravate the infection. It is also often impossible to decide how many of the pathological anatomical lesions are due to the concretions and how many may be referred to the infection.

Of most interest were the histological examinations of extirpated kidneys or other operative specimens. On the whole it may be said that the examinations showed the presence of chronic pyelitis and ureteritis but very light parenchymal lesions. This is interesting since many believe that staphylococci are the most common cause of purulent processes in the kidneys or neighboring tissue. In ureteritis or severe pyelonephritic lesions were observed only in a few cases and then it was generally a question of a secondary infection with bacilli. Not infrequently the most pronounced inflammatory change are found in the very niches of the calices which is of interest since the tone for mat on is usually often benign therein. The kidney itself generally shows only light inflammatory lesions and the usually take the form of small subcapsular round cell infiltration or connective tissue scars infiltrated with the cell. The glomeruli and tubular epithelium show practically no changes.

anism It is the seat of volitional inhibition and release and co-ordinates the act of voluntary micturition Finally, psychic and chemical causes must be considered in the total evaluation of the vesical response
LOUIS NEUWELT, M D

Wear, J B End-Results of Tuberculous Cystitis
Report of Cases *Arch Surg*, 1938, 37 821

It is now generally recognized that renal tuberculosis is a local manifestation of a general disease, and treatment is executed with that fact in mind For other parts of the body, rest is the best method of treatment, but for the bladder rest is impossible French writers have called attention to the necessary activity of the bladder as a possible reason for failure of the lesions to heal The change in the vesical wall may be in the form of multiple ulcers which cause a painful frequency of urination, or the condition may progress to produce the well known contracted and sclerotic bladder wall with an extreme reduction in capacity

Nephrostomy, cystostomy, ureterostomy, and ureteral transplantation to the rectum have all been used as palliative procedures in tuberculous cystitis

As an example of the possibly destructive nature of tuberculous cystitis the author presents 2 cases which demonstrate destruction of an uninfected kidney by ureteral obstruction and total loss of vesical function as a result of sclerosis and destruction of fibrous tissue
D E MURRAY, M D

Valvêrde, B Syphilis of the Bladder (La syphilis de la vessie) *J d'urolog med et chir*, 1938, 46 330

Valvêrde maintains that syphilis of the bladder is not a rare condition although Young and other urologists in the United States state that they have never seen a case of this lesion The contention that syphilis of the bladder cannot be proved to be a specific lesion, because the spirochetes are not demonstrable, is not tenable in view of the fact that modern studies have shown that spirochetes are not always demonstrable in lesions recognized as definitely syphilitic

The author's diagnosis of syphilis of the bladder is based upon his clinical observations, i e, the cystoscopic appearance of the lesions and the effect of specific treatment In his private practice and in the Polyclinic of Rio de Janeiro, Brazil, cystoscopic examination has been made in 721 cases, and 129 cases of syphilis of the bladder have been found The various types of syphilitic lesions of the bladder which were distinguishable on cystoscopic examination include

- 1 Ulcers which are deep with irregular borders and resemble an indurated chancre in color, these syphilitic ulcers are rarely multiple, the mucosa around the ulcer appears practically normal

- 2 Papules or papuloid syphilides, one of the most characteristic lesions of syphilis of the bladder

- 3 Infiltrations of the mucosa causing localized cord-like thickenings, sometimes in a form resembling the convolutions of the brain

- 4 Leucoplakia, which was definitely of syphilitic origin in 2 cases observed by the author

- 5 Secondary exanthema showing typical characteristics of the secondary lesions of syphilis

- 6 Vegetations resulting from chronic inflammation and active proliferation of the bladder mucosa The syphilitic inflammation sometimes produces a mosaic appearance, in other cases it is accompanied by a false membrane (diphtheroid), edema, ecchymotic plaques, and punctate hemorrhages also may be found in syphilis of the bladder

One of the most frequent symptoms of syphilis of the bladder is hematuria, according to reports by others, but in the author's 129 cases, hematuria was noted in only 15 cases In his cases the symptoms most frequently observed were vesical pain and signs of cystitis, such as frequent urination, dysuria, and cloudy urine However, in some cases of syphilis of the bladder, there are no clinical symptoms indicating involvement of this organ, hence the need for routine cystoscopic examination in cases of syphilis

The value of specific treatment in syphilis of the bladder is twofold, it relieves the symptoms and clears up the lesions, and thus it confirms the diagnosis Improvement begins as a rule early in the course of treatment, a few patients show a reaction of the Herxheimer type, either local or general, but treatment must be continued to obtain the desired result The author has found mercury and bismuth in colloidal form most effective in syphilis of the bladder, but also uses the arsenicals and iodides according to indications
ALICE M MEYERS

Barringer, B S Radium Therapy of Bladder Carcinoma, Five-Year Results, Failures, Future Therapy *J Urol*, 1938, 40 606

A review of 215 cases of carcinoma of the bladder shows 69 (32 per cent) three-year cures Five-year cures number 52 (24 per cent), a drop of 7.6 per cent In 96 cases (44.6 per cent) the bladder was reported as being "cancer-free" Fourteen cases have been cured more than ten years The cases were treated cystoscopically and by suprapubic implantation of radium The pathological picture in the 96 cures ranged from papilloma with atypical cells to Grade-4 adenocarcinoma

The author concludes from statistical studies that an infiltrating carcinoma is more difficult to cure than papillary carcinoma The chief cause of death is unquestionably severe infection of the bladder and kidney, few patients dying of carcinoma In contrast to the view of the Carcinoma Registry in emphasizing that bladder cancers are more often multiple than single, the author believes that vesical carcinoma is more frequently single than multiple

Not only the size of the tumor, but the status of the kidneys and the degree of infection should determine the method of treatment The author is favoring cystoscopic therapy to suprapubic therapy in an increasing number of instances He believes that if the tumor is ulcerated and infected and if one or

gether and a progressive lowering of the roof of the bladder toward its base with a nearer approach of the fundus toward the neck of the bladder.

The ureteral orifices should always be located symmetrically in the bladder but anomalies may occur because of congenital or pathological conditions for example there may be displacement of one orifice due to physiological causes in which case the two orifices move nearer together during the emptying of the bladder displacement of one orifice inward or outward due to pathological causes in which case the involved orifice remains stationary during emptying of the bladder or displacement of the two orifices due to physiological or to pathological causes in which case the two orifices behave as previously mentioned for the respective causes.

In uterine fibroma endoscopic study is useful only when the fibromyoma has developed in the ligament (unilateral or bilateral) displacement outward of the ureteral orifices or when it has caused adhesions between the anterior aspect of the uterus and the posterior aspect of the bladder (immobility of the vesical fundus and lack of formation of typical folds).

In uterine carcinoma endoscopic study may reveal numerous and various changes in the vesical mucosa and should never be neglected because it gives diagnostic information and therapeutic and prognostic indications. In the presence of paravesical tumoral infiltration or of adhesions between the opposing aspects of the uterus and the bladder the formation of folds is absent in the involved area the interureteral ligament remains immobile and the ureteral orifices are but little displaced while if the parametrium is invaded one or both orifices are immobile. Of course partial or total immobility of certain parts may occur also in other gynecological disorders but these can be easily differentiated by gynecological examination.

In the presence of postlaparotomic adhesions between the bladder and neighboring organs the bladder does not empty completely but assumes a triangular form with the apex turned outward a state which persists during the entire period of emptying. In the presence of adhesions between the inflamed uterus and the bladder the formation of the normal folds on emptying of the bladder is arrested at the area corresponding to the trigonal and retrotrigonal portions at times to the base of the bladder emptying of the bladder is then incomplete.

RICHARD KEMEL, M.D.

Zimmerman, I. J. The Neuromuscular Physiology of the Detrusor Muscle of the Urinary Bladder. *J. Urol.* 1938 40 766.

The functions of the urinary bladder to store and expel urine are modified in health and in disease by local remote and general factors. Any disease altering the functional activity of the detrusor muscle or of the bladder as a whole as manifested by abnormal symptoms or signs even though non-neurogenic in origin presents in the bladder a problem which can be appreciated only in the light

of neuromuscular physiology. Any of the activities of the bladder occur in response to a stimulus. The pathological processes in the bladder the urinary tract or other parts of the body causing vesical dysfunction are static and at best describe the nature of the stimulus. An understanding of the nature of the response implies a dynamic concept in terms of physiology. Nerve lesions severing the bladder from its hierarchical neurological superstructure at any level can best be understood in terms of nervous disintegration at the respective level.

The characteristic fundamentals of the physiology of the detrusor muscle of the bladder are to be found in a study of the physiology of independently acting smooth muscle the bladder being essentially a reservoir composed of smooth muscle. By exhibiting irritability or local reaction to a stimulus the property of intermittent rhythmic contractility tonus the ability to do equal amounts of work at different lengths and the ability either to contract or to relax upon application of the same or similar stimuli smooth muscle proves itself to be the basic vital stratum of the physiology of the bladder. The intricate system of nerves intrinsic and extrinsic together with the chemical substances brought to the bladder by the blood stream merely condition the native response of the muscle.

The author presents in detail each of the important superimposed structures modifying the native response of the detrusor muscle. An intrinsic nerve net unifies the action of the individual muscle fibers and intensifies and makes more efficient the response of the organ. The peripheral sympathetic nerves as shown to be concerned essentially with homeostasis or with the maintenance of a state of constancy as a regulator and modulator in the genito-urinary organs the degree and type of the effects depending upon many factors. While the sympathetic nerves appear to be somewhat general in their action the parasympathetic nerves tend to be specifically localized in their effect they are the motor nerves to the bladder and constitute the essential peripheral pathway for the voluntary emptying of the bladder. On the sensory side of the reflex arc all the fibers necessary for complete micturition as far as the detrusor muscle is concerned would seem to be resident in the parasympathetic system. Reflex centers for micturition in the spinal cord place the bladder in intimate relationship with the other organs having centers in the same segment. The release of the mechanism by impulses from the higher centers explains the presence of the mass reflex with evacuation of urine. The spinal pathways to and from the bladder course in the dorsal portion of the lateral columns. Because of the decussation of the fibers one pathway on either side is sufficient to maintain a control if the other side be impaired. A midbrain mechanism enhances the reflex excitability of the cord thus intensifying the response of the bladder. The biological superimposition of the cerebrum presents the supreme co-ordinating mech-

tures. An extensive traumatic stricture should be resected, with closure by circular suture or repair over an indwelling catheter. Perineal fistulas usually close spontaneously after cure of the stricture. Cases of cutaneous urethral fistula must be treated by excision and repair of the urethra after a preliminary cystostomy.

None of the author's patients noted loss of potency as a result of the injury to the urethra. However, in other cases impotence has sometimes resulted from such injuries. The author believes that such impotence is of psychic origin and must be treated by psychotherapy.

Every patient who has sustained an injury to the urethra, however slight, should be kept under observation for a considerable period, in order to avoid the development of stricture or of an ascending infection.

ALICE M. MYERS

Chauvin, E. Some Considerations on the Pathogenesis of Priapism (Quelques considerations sur la pathogenie du priapisme) *J. d'urolog. med. et chir.*, 1938, 46, 224.

Chauvin reports 2 cases of priapism occurring in young men, both in good health. Neither of the patients showed any evidence of leucemia, nervous disease, infection, or local neoplasm. In both cases, operation was necessary. In the first case the incision was made at the base of the penis on the left side. The tunica albuginea was hard, when this was incised, blood escaped, the blood was dark-colored, thick, but fluid with no clot formation, as the blood escaped, the priapism subsided, the blood came from the corpora cavernosa. A small subcutaneous hematoma developed at the site of the operative wound, and this was removed by reopening the skin incision. The patient made a good recovery. The blood which was carefully collected as it drained from the wound showed no coagulation when kept in the test tubes for days. The blood was concentrated, as shown by the cell count, but the differential leucocyte count was normal except for a slight eosinophilia, which had also been noted in the patient's circulating blood.

In the second case, the incision was made first on the right side of the penis. When the tunica albuginea was incised, a little dark blood escaped, and then a vigorous "jet" of red blood, a second incision on the left side resulted in an equally strong flow of red blood. This blood was normal in color and fluid without any tendency toward clot formation. The tunica albuginea was carefully sutured, a hematoma formed at the site of the operation, but gradually subsided. The priapism did not subside as rapidly in this case as in the first case, but more gradually as the hematoma subsided.

In considering the pathogenesis of priapism, the author considers four theories of the etiology of this condition: (1) nervous disturbances, (2) obstruction of the venous return circulation, (3) hematoma of the penis, and (4) thrombosis of the corpora cavernosa. Pathological conditions in the nervous

pathways controlling the erection of the penis may account for certain cases of priapism, but not for the majority of cases, and certainly not for the 2 cases reported. Obstruction of the venous return circulation has also been demonstrated occasionally, but it cannot be considered to be the cause in cases in which the circulatory stasis was localized in the corpora cavernosa.

The theory of a hematoma of the penis as a cause of priapism may explain the priapism which develops in leucemia with its various hemorrhagic manifestations, or following trauma. However, there are objections to this theory, especially when as in the author's cases, the collection of blood was limited to the corpora cavernosa. Also in the author's cases, the blood flowed out easily when the tunica albuginea was incised, while it is well recognized that the evacuation of a hematoma is difficult. In one of the author's cases, moreover, a small piece of the erectile tissue was removed and examined microscopically, it showed leucocytic infiltration, but no evidence of infiltration of blood.

The theory which best explains the occurrence of priapism in the 2 cases cited and in many others, in the author's opinion, is that it is caused by an obstruction of the venous capillaries, especially in the corpora cavernosa, by blood that is thickened and viscous. Abnormally prolonged erections, either pathological (myelopathy) or physiological (sexual excess) would produce such condensation of the blood, this would be favored by pre-existing abnormalities of the blood, such as leucemia or hyperviscosity.

ALICE M. MYERS

GENITAL ORGANS

Wille-Baumkauff, H. Endo-Urethral Electroresection in Carcinoma of the Prostate Gland (Die endourethrale Elektroresektion beim Vorsteherdrüsenkrebs) *Beitr. z. Klin. Chir.*, 1938, 168, 467.

The unsatisfactory results of the various methods of treatment in carcinoma of the prostate have led to the use of endo-urethral electroresection. The latter is used either alone or together with radium irradiation.

Of 56 patients, 6 were treated by perineal or suprapubic prostatectomy, 10 by suprapubic cystostomy, and 20 by electroresection, and 20 were treated conservatively with the indwelling catheter. In cases of benign hypertrophy of the prostate, excision is employed routinely. Even in early carcinoma, the success of operation is in most instances questionable, and for this reason, one should rather employ the less traumatizing electroresection and determine whether, with improvement of the general condition of the patient, the perineal radical operation might still be possible.

Electroresection is employed only in those cases in which complete retention, or large amounts of residual urine are found in spite of decompression treatment. After a somewhat protracted period of

both kidneys are hydronephrotic the suprapubic implantation of a large amount of radium is a dangerous procedure from the standpoint of infection.

The various forms of radiation—radon seed x ray alone and in conjunction with radon seeds fulguration fulguration with x ray pre operative and postoperative irradiation and radium application—are classified and commented upon. Radon seeds have constituted the best method for both suprapubic and cystoscopic application of radium. Deep x ray therapy has failed. *AARMA H. MILBERT M.D.*

Heitz Boyer M. Submontanal and Membranous Regions of the Posterior Urethra. Roentgenographic and Cystoscopic Studies. (Les régions sous montanale et membraneuse de l'urètre postérieur. Leur étude urolographique et urétroscopique). *J. d'rol. m.d. et chir.* 1938 46 154

Heitz Boyer notes that the region of the verumontanum and the area above it are constantly being explored and studied by cystoscopic and roentgenographic methods but the position of the posterior urethra below the verumontanum (the submontanal region) and the membranous urethra are usually given little attention in such studies. In recent years however the author has studied these portions of the posterior urethra more carefully and has found that pathological conditions may be present when the verumontanum and the bladder neck are normal.

Roentgenograms are made from the front and from each side. The verumontanum is easily distinguished below this the urethra is seen to be narrow for a distance of from 7 to 8 mm. then there is an ampullar dilatation beginning abruptly which is clearly demarcated from the narrower portion above it. In some cases the lower limit of this portion is also clearly demarcated from the region below it in other cases this demarcation is not so clearly defined.

The cystoscopic findings correspond exactly with the roentgenographic findings. The portion of the urethra just below the verumontanum shows a median ridge at the lower end of this portion there is usually a definite valve like formation which distinguishes it from the dilated portion below. In the majority of cases the lower limit of this dilated portion (the ampullar dilatation) is also demarcated by a valve like form but with its concavity above—the reverse of the curve of the upper valve. Sometimes this lower valve is not clearly defined but vestiges of it can be found. This valve marks the boundary line between the posterior and the anterior urethra. The narrow portion of the posterior urethra just below the verumontanum is the submontanal portion the dilated portion corresponds to the membranous urethra.

The author has observed two types of lesions in these sections of the posterior urethra both type cause symptom suggestive of prostatic disease or obstruction of the bladder neck yet careful ex-

amination fail to show the latter. The first type is neoplastic and is characterized by polyps originating in the posterior urethra the second type is diverticular and is composed of a diverticulum or fistula also originating in the posterior urethra. These lesions can be demonstrated by roentgenographic and cystoscopic study if attention is directed to the submontanal and membranous portions described. Both types can be successfully treated by endoscopic methods employing various type of the high frequency current. *LUCA M. MEYER*

Bartkowiak Z. Traumatism of the Urethra in Men (Les traumatismes de l'urètre chez l'homme). *J. d'rol. m.d. et chir.* 1938 46 415

Bartkowiak reports 13 cases of trauma of the urethra from the Necker Hospital in 6 of the cases there was rupture of the anterior urethra and in 3 rupture of the posterior urethra in 3 cases there was posttraumatic stricture of the anterior urethra and in 1 stricture of the posterior urethra.

On the basis of his experience in the cases the author concludes in regard to the treatment of traumatism of the urethra that the procedure must be determined for each case according to the site of the lesion the lesions of the surrounding organs and tissues produced by the same trauma and the symptoms exhibited. It is always necessary to incise and drain a large perineal hematoma. If the patient is able to urinate after the accident no special treatment of the urethra is necessary, if urinary retention develops later a temporary cystostomy should be done and treatment carried out as in cases with retention of urine occurring immediately after the accident. In the latter type of case a cystostomy is done at once any hematoma is drained and emptied and any small bone fragment present are removed (in cases of associated fracture of the pelvic bone). If the urethral lesion is of limited extent and the patient's general condition is good an immediate urethrectomy with circular suture may be done without the use of an indwelling catheter since the cystostomy remains open. In other cases repair of the urethra is not done for at least six weeks. Whenever possible urethrectomy and closure by circular suture are carried out without the indwelling catheter the author has been able to repair a loss of substance of as much as 5 cm. by this method. When the loss of substance is too great however for the use of this procedure a plastic operation with skin grafting is employed for the anterior urethra and for the posterior urethra a reconstruction operation over an indwelling catheter. For the cutaneous graft the hair must be destroyed in the skin employed or better a skin area which is free from hairs should be used. If the indwelling catheter fails only an external urethrotomy must be done to replace the catheter the perineal wound is left open and dried but heals rapidly.

Traumatic stricture can usually be treated by progressive dilatation systematically carried out in internal urethrotomy is not indicated in such cases.

crease the concentration of sulfanilamide in the blood to 5 mgm per cent. This could be accomplished by giving 5 gm daily. The effect of sulfanilamide is the same on whole blood or plasma heated at 56° C for two hours, or unheated. This indicates that the action is due to the sulfanilamide and not to any other factors in the blood.

D E MURRAY, M D

Vest, S A, Hill, J H, Harrill, H C, and Pitts, A C. Studies in the Use of Sulfanilamide in Gonorrhea. I Experimental Observations. II Clinical Observations. *J Urol*, 1938, 40: 698, 716.

In order to determine more accurately the metabolic changes which occurred during the administration of sulfanilamide, 25 patients were hospitalized and careful chemical studies of the blood and urinary changes were made. These patients received an initial dose of from 0.8 to 0.1 gm per kilogram of body weight, followed by approximately 1 gm every four hours thereafter for several days. Numerous deductions and conclusions have been drawn from these studies by the authors.

They found no differences in the amount of free and combined sulfanilamide in both the blood and urine to account for the response and the lack of response in such treated cases. No difference was noted in the ratio of free to combined sulfanilamide in the blood and urine to account for clinical response. Patients have failed to respond with high blood and urine concentrations of sulfanilamide. There was no difference in the clearance or rate of excretion of sulfanilamide to correlate with the clinical response.

In studying the urethral changes after the ingestion of sulfanilamide, the authors noted a marked reduction in the number of gonococci before an appreciable amount of the drug was excreted in the urine. In some instances gonococci disappeared before any contact with urine containing sulfanilamide, which indicated action through the blood stream. Urethral pus contained sulfanilamide in concentration approximately the same as or slightly higher than that of the blood. Urethral phagocytosis, which might account for the disappearance of the gonococci, was not noted.

Having shown by experimental studies that there were no differences in the metabolism of sulfanilamide, its concentration in the blood and urine, or its rate of excretion to account for response and lack of response, the authors conclude that the drug acts in some unknown way through its presence in the urethral fluids in approximately the same concentration as in the blood. Clinical studies were made on cases drawn exclusively from the out-patient dispensary and taken in consecutive order.

Because of the difficulty of carrying out uninterrupted treatment and continual observation, results were necessarily not comparable to those achieved in private practice or in hospitalized cases. Although 115 individuals were started on sulfanilamide

therapy, only 77 case histories could be analyzed after the elimination of those with insufficient data and those clinically cured but which could not be followed. In this reduced series, 46 or 60 per cent were apparently cured as judged by very exacting criteria including cultures.

It was noted from careful cultures that gonococci can persist in the prostate after insufficient treatment and that in some instances they disappear from the prostate some time after urethral cultures have become negative. For this reason, an initial dose of from 0.8 to 0.1 gm per kilogram of body weight administered in the evening and followed by divided doses totaling from 60 to 100 gr a day over a sufficient length of time is suggested by the authors as the most effective therapy of gonorrhea in the male in the out-patient department.

ARTHUR H. MILBERT, M D

Kretschmer, H L. Multiple Primary Cancers. *J Urol*, 1938, 40: 421.

The subject of multiple primary malignant neoplasms is of great interest to the surgeon for the following reasons: (1) he is faced with the surgical management of two primary malignant tumors instead of one, (2) it may mean one or two major surgical procedures, depending on the location of the tumors, (3) he is faced with the problem of obtaining a cure of two or more malignant tumors in the same patient, and (4) he must determine, by careful histological study, the exact nature of the tumors, so that he is positive that he is actually dealing with two different independent malignant tumors.

Multiple primary malignant tumors occurring in the same patient may be classified in two groups: (1) tumors which are present when the patient comes under observation, and (2) tumors occurring in succession, that is, the patient has been cured of one malignant tumor and subsequently has developed a second, or even a third tumor. In other words, in the first group multiple malignant tumors are present in the patient at one and the same time, and in the second group the patient has multiple tumors which are not present at the same time, but which develop in succession.

When it became evident to the older clinicians that it was possible for a patient to have two or more independent primary neoplasms, it was imperative to set up certain criteria which were to be met and fulfilled in order that the fact that the patient really had two independent primary neoplasms could be established. The first criteria for multiple malignancies were the postulates of Billroth, which were as follows: (1) each tumor must have an independent histological appearance, (2) the tumors must arise in different locations, and (3) each tumor must produce its own metastases. To these postulates, Mercanton added a fourth, to the effect that following the operative procedure the patient must remain free of the disease, which will demonstrate that the growths were independent, since, had either one been a metastasis it would be reasonable to assume

preparatory treatment electroresection is usually performed under sacral anesthesia and from 2 to 7 gm of tissue are removed. When the tissues cut easily and there is little bleeding carcinoma is usually present.

Of the 20 patients treated by electroresection 12 are still living and 11 are completely free of symptoms after an average period of nine months. Of the patients treated conservatively only 1 of 6 who survived is in a tolerable condition as far as the bladder is concerned. A stimulation of the growth of the carcinoma which could be attributed to the electroresection was not observed. Statistical tables show the results and the survival period following the various methods of treatment. Supplementary roentgen radiation did not produce an indisputably favorable influence in any of these methods.

(KARL ABEL) HARRY A. SALZMAN, M.D.

Ormond J. K. Torsion of the Testicle *J Am M Ass* 1938 111 1910

Torsion of the spermatic cord, a well established clinical entity, has been observed in every decade of life from infancy to old age, though most commonly during adolescence. While the condition is uncommon, its recognition is of considerable importance as failure of diagnosis results in testicular atrophy. The author refers to the work of Abeshouse who found 350 instances of the condition in the literature and adds 12 cases of his own.

Two types of torsion are described, intravaginal and extravaginal, the former being seen much oftener than the latter. Torsion of the testicle has been mistaken for acute epididymitis, acute orchitis, strangulated hernia, suppurative inguinal adenitis, acute hematocoele and ureteral calculus. To facilitate the diagnosis one must consider the age of the patient, a history of sudden onset of the symptoms, the severity of pain, absence of history or evidence of genito-urinary infection, the position of the affected testicle in the scrotum, the position of the epididymis with reference to the testicle, tenderness of the testicle and lastly Prehn's sign (accentuation rather than relief of pain on elevation of the scrotum).

Twelve illustrative cases are presented by the author who believes that in an acute attack prompt operation offers the best chance of a healthy testicle. Even though an attack is relieved by manual or spontaneous detorsion, operation should be done soon to prevent recurrence and if because of torsion a testicle has become atrophic or has been removed, operation should be done on the remaining testicle before a like fate befalls it.

ARTHUR H. MILBERT, M.D.

MISCELLANEOUS

Schoenrich H. Sulfanilamide in Clinical Gonorrhea. A Study of 60 Cases. *J Urol* 1938 40 684

In contrast to previously reported studies on the efficacy of sulfanilamide in gonorrhea, in which the

drug was used to the exclusion of all other therapeutic measures, the author presents a series of 60 cases in which the combined use of systematic local medication together with oral administration of sulfanilamide was employed. All of the patients were male with ages varying from eighteen to fifty years; they were seen in private practice.

Local therapy consisted of daily medication with colloidal silver preparations applied to the anterior urethra and suitable measures for posterior urethral and prostatic involvement. Sulfanilamide was given in four divided doses, the dosage totaling 540 gr. in ten days. Eighty grains were prescribed on the first two days, 60 gr. the next three days and a progressive diminution of the drug thereafter. Ten grains of bicarbonate of soda were given with each dose of sulfanilamide. Toxic symptoms occurred in 13 cases. Of the 60 patients, 55 completed their treatment satisfactorily in an average time of twenty days and were subsequently discharged as cured. Five failed to complete their treatment or failed to report over the required period of observation. On the initial visit, 44 (73 per cent) presented anterior urethritis and 16 (27 per cent) posterior urethritis of a specific nature. Proof of cure in each case was based on repeated clinical and bacteriological examinations during which time provocative measures were instituted.

The author believes that until a larger series of cases are followed over a longer period of time with studies relative to safe and effective dosages, sulfanilamide must be regarded as a valuable addition to our armamentarium rather than a substitute for the hitherto accepted methods of treatment.

ARTHUR H. MILBERT, M.D.

Keeler C. S. and Rantz L. A. Sulfanilamide. A Study of Its Effect on the Bactericidal Power of Whole Blood for the Gonococcus. *Am J Syph* 1938 22 679

In previously published papers it was indicated that during and following gonococcal infections the bactericidal power of the whole blood or plasma increased. It was also noticed that the administration of sulfanilamide by mouth to patients with gonococcal infections induced an increase in the bactericidal action of the whole blood and synovial fluid. The authors therefore deemed it desirable to determine whether or not this increase could be accomplished in individuals without gonococcal infections. They also attempted to determine the quantitative relationship between the amount of sulfanilamide in the blood and the bactericidal power.

From their observations they concluded that the administration of sulfanilamide by mouth increases the bactericidal power of the whole blood for the gonococcus, which is independent of the development of specific antibodies. Sulfanilamide does not delay or prevent the development of complement fixation antibodies.

In order to obtain optimum increases in the bactericidal power of the blood, it was necessary to in

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Santelmann, G A . Aseptic Osteochondral Necroses with Special Consideration of Their Roentgenological Characteristics and Peculiarities (Die aseptischen Knorpel-Knochennekrosen unter besonderer Berücksichtigung ihrer roentgenologischen Uebereinstimmungen und Besonderheiten) Goettingen Dissertation, 1937

The designation "aseptic osteochondral necroses" appears to be the best term for the numerous pathological phenomena which may be grouped under this title. Definitions which refer to an inflammatory process or which would restrict the disease to a definite stage of development are not suitable. The conception of epiphyseal necrosis is too narrow since it does not include diseases of the apophysis and of the diaphysis, although the latter are very rare. The literature on the subject comprises about 900 publications in the last twenty years.

On the basis of cases which were observed at the Goettingen Clinic, the author describes, with the aid of excellent illustrations, Perthes' disease, Koehler's diseases, Schlatter's disease and apophysitis calcanei, also semilunar malacia and Scheuermann's disease. The cases are considered from the following viewpoints: history, incidence, clinical course, causes, pathological anatomy, and roentgenology. He comes to the conclusion that the different distribution of all these disease processes to numerous portions of bone permits no uniform picture to be presented. Sparring of the affected part, pain, sensitiveness to pressure, swelling, restriction of motion, and muscular atrophy are the chief diagnostic points. In semilunar malacia, an acute form caused by trauma is to be distinguished from a gradually developing form in which the pathological condition is effected by an unrecognized continuous process. Treatment should be chiefly conservative with consideration of immobilization and relief from strain of the portion of bone involved.

For the pathologico-anatomical description of the condition, the work of Axhausen is fundamental. The histological investigations are, of course, comparatively rare and present only a stage of the whole pathological condition which covers a period of months or years.

We find evidences of fracture with fragmentation of bone and dead cellular tissue masses, calcifications, remains of old hemorrhages, cysts, and necrotic foci together with signs of callus formation and osteogenetic activity. Young granulation tissue with giant cells may simulate osteitis fibrosa. Numerous attempts have been made to explain the causes of aseptic osteochondral necrosis. Most investigators assume a nutritional disturbance based upon embolic vascular occlusion (Axhausen, Weil),

endarteritis obliterans (Konjetzny, Koenig, Rauch, Zweig), a traumatic obstruction of the vessels (Aschhoff), and a mechanical derangement of the vessels or a venous stasis (Roesner). These are the champions of primary necrosis which may cause fracture. Other authors believe that fracture precedes necrosis, and that it occurs in living tissue. It is certain that trauma may be the cause of aseptic osteochondral necrosis. Numerous other hypotheses assume an infectious process, a disturbance of calcification or of growth, heredity, variations in colloidochemical action, in general, physicochemical conditions. Weis accepts three conditions as causes of aseptic osteochondral necrosis: positional exposure, local conditions unfavorable to the healing processes, and local or general inferiority of the skeleton. The author is of the opinion that aseptic necroses occur "when a disparity exists between the strain and the power of resistance of the bone together with a readiness of the tissue to respond thus and not otherwise to the over-load." The roentgen examination is most important.

The course of aseptic osteochondral necrosis, according to roentgenological evidence, is about as follows: at first the fine uniform network of bony trabeculae is effaced and interrupted, this is associated with areas of rarefaction, speckled, cloudy, and circumscribed, simultaneously or later, dense spots of bone tissue appear, evidences of malformation follow, accompanied by clumpy-disintegration of the bone. Upon the basis of conformity of the roentgenological evidence and upon the convincing clinical signs, despite faulty or incomplete pathologico-anatomical findings, aseptic osteochondral necrosis may be considered a uniform pathological condition.

(NESTMANN) J M SALMON, M D

Burman, M S, and Sinberg, S E. Solitary Xanthoma (Lipoid Granulomatosis) of Bone. *Arch Surg*, 1938, 37: 1017

Xanthomatous bone tumor, isolated or multiple, occurring in the absence of the Schueller-Christian syndrome is rare. The authors report a case occurring as a solitary bone cyst in a boy aged twelve. This was discovered as an accidental finding following an x-ray examination for Osgood-Schlatter's disease.

A slightly tender bony swelling could be palpated on the mesial aspect of the femur, about 2 in. above the patella. There was no heat or redness in the overlying skin. The roentgenogram showed a roughly ovoid area of rarefaction the size of a quarter at the junction of the lower and middle thirds of the left femur with a few smaller "daughter" areas of rarefaction proximal to the main lesion. The cortex was thinned but not broken. There was no periosteal reaction or invasion of the soft tissue. No lesions were found in the other bones of the skeleton. The

the presence of other metastases and the patient would not remain free from evidence of the disease.

The vast majority of the recorded cases of multiple malignancies have been diagnosed at autopsy. This fact can be explained in several ways.

1. In many cases the second tumor may be small and therefore clinically silent at the time of the death from the first malignancy and the condition of multiplicity may be revealed only at autopsy or by microscopic examination.

2. When in the presence of a known malignancy a second neoplasm is noted it is readily dismissed as an extension, recurrence or metastasis of the first growth.

Write call attention to the fact that the infrequency of two simultaneous lesions in an organ has naturally made the search for such a condition both before and during operation not a matter of routine; therefore such lesions are usually found by accident rather than by diligent effort.

With the improved facilities for diagnosis and the routine employment of modern diagnostic agents including biopsy examinations the clinical reports of the diagnosis and treatment of multiple malignancies are becoming more frequent.

One might also call attention to the fact that when a second tumor arises in a patient who already has been cured of one neoplasm the first diagnosis and frequently the only one made is that of metastasis. The suspicion that it may be a new and independent growth is not considered as frequently as it should be. As our skill in treating malignancy improves there should be an increasing frequency of recognition of this type of growth.

Detailed reports of 5 cases of multiple primary malignancies are presented. Studies would seem to indicate that these tumors show a greater incidence in the United States than in Europe. They are probably more common than has been believed heretofore.

FRANK HESS, M.D.



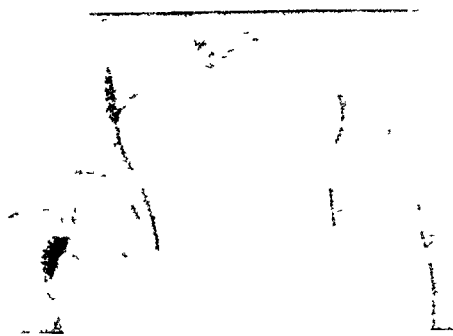


Fig 1 The early stage of bilateral coxa vara

ened neck, (4) a decreased angle between the neck and shaft, and (5), in some cases, a translucency of the femoral head

The cause is considered to be a slow aseptic necrosis followed by regeneration of the bone. In this it resembles the process which occurs in pseudocoaxalgia, and in Koehler and Kienboeck lesions. It differs only in the fact that regeneration will not occur so long as weight-bearing takes place across the line of the femoral neck, and does not occur when the upper end of the femur is re-aligned so that weight is borne along the line of the neck.

Treatment consists of a wedge osteotomy, the wedge being sufficiently wide at its base to allow the femoral neck and the shaft of the femur to come into line (Fig 2). This necessitates a very wide abduction, and unless this apparently exaggerated abducted position is obtained, the operation may fail. After the osteotomy has been performed, the weight of the body is carried almost vertically through the femoral neck, and not across it as before. The neck then becomes changed in character and develops into really bony structure.

Very good results are reported and 9 representative cases in various stages of treatment are illustrated.

Twenty cases of "slipped" femoral epiphysis are analyzed. The author does not consider the condition to be due to trauma but to disease related chiefly to endocrine imbalance.

With the help of Jones at Manchester University, the author tested the effects of various forces on the epiphyses of femurs removed post mortem from children fourteen and fifteen years of age, respectively, who died of causes not related to bone disease. A steel pin 8 in. long and $\frac{3}{16}$ in. in diameter was driven through the epiphysis, and the pin was fixed to the workshop bench. Abduction force was slowly applied to the lower third of the shaft. The amount of strain was carefully measured, and it was found that fracture occurred at points between 45 and 50 lbs of force. In both cases the fracture took place through the femoral neck distal to the epiphyseal line, and the line itself remained unmoved. The author concludes that the trauma will not produce a clean separation in a normal epiphysis, the epiphysis must be first weakened by disease.



Fig 2 Correction obtained by osteotomy changing the weight-bearing line

All of the author's patients except 2 were large children and 11 of them were of the adiposogenital type.

The children should be treated during the pre-slipping stage, by immediate fixation in plaster, and all weight-bearing should be prevented for three months, then a caliper should be used for six months. The opposite hip should be examined very carefully. For those cases in which slipping had occurred recently, replacement under anesthesia and fixation in plaster were performed. In cases of some weeks' standing in which manipulative replacement could not be effected, a subtrochanteric osteotomy was performed and the limb was abducted sufficiently to produce the normal angle of the neck. This was preferred to open reduction and fixation with the Smith-Petersen nail or any device which might prevent bone growth.

Good results are reported and 6 representative cases in their stages of treatment are illustrated.

F HAROLD DOWNING, M D

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Saegesser, M. The Treatment of Bone and Joint Tuberculosis (Die Behandlung der Knochen- und Gelenktuberkulose). *Schweiz med Wchnschr*, 1938, 1: 737

Detailed summation of modern accepted standards in the treatment of bone and joint tuberculosis reveals no essentially new aspects. A middle course has been found between the two extremes of purely surgical procedures and conservative helioclimatology; it is not restricted to a single method, but takes into consideration all existing methods of value, above all, the individual aspects of each case require consideration. Since none of the previous methods of handling surgical tuberculosis developed any procedure of special significance, results must be obtained from a correlation of the numerous methods used in the individual cases, such results cannot be determined from the sole application of a single method of treatment. In order to decide which treatment most quickly attains its goal, it is neces-

cholesterol content of the blood was 224 mgm per 100 c cm

The tumor was resected *in toto* on November 2 1936 A complete description of the gross and pathologic findings are given

On June 19 1937 an x ray showed recurrence of the tumor at a point near the operative site The patient was given a diet low in cholesterol and 6 roentgen treatments The last roentgenogram taken on January 21 1938 showed complete healing of the primary and recurrent lesions There was no increased urinary output no prominence of the eyes and no palpable tumor of the skull

It is likely that multiple osseous involvement not gross enough to be detected by the roentgen ray may exist Geschickter and Copeland in a study of 17 cases of Schueller Christian disease noted that in 2 cases the symptoms of onset were related to solitary lesions Cases reported by other authors were reviewed

For the isolated form of the disease effective therapy consists of resection of the tumor when possible or curettage When it is possible to establish the diagnosis without biopsy roentgen therapy is the treatment of choice Diet low in cholesterol should be tried

The ultimate fate of the patient is not indicated in any of the case reports

F HAROLD DOWNING MD

Allende G Giant Cell Tumors of the Bones (Los tumores de los huesos a células gigantes) *Rev de ortop y traumatol* 1938 8 113

Among the tumors of the bones there is an easily recognized variety which is of benign character is amenable to conservative treatment and represents a lesion in which one of the greatest recent advances has been made in the treatment of the pathology of the bones These tumors have been given various names in the previous literature but are now described as giant cell tumors of the bones which indicates their predominant characteristic the presence of giant cells without inferring their origin Allende reports 8 cases

From the anatomical and pathological points of view these tumors are macroscopically very vascular resembling placental remnants or blood clots and presenting a variable consistency from fibrous of more or less density to fluid according to their degree of evolution Microscopically three basic elements are encountered the giant cell which in general contain more than 15 nuclei grouped together in the center of the cell the stroma which is constituted by round fusiform or stellate cell with nuclei showing no abnormal mitosis or nuclear monstrosities proper to malignant tumors and finally the vascularization which occurs in lacunar form or under the form of capillaries The pathogenesis of these tumors is still the subject of discussion and the various theories propounded attribute to the tumors a vascular infectious or tumoral origin the latter being probably nearest to the facts

Clinically giant cell tumors of the bones cause little pain increase slowly in size do not give rise to adenopathy and do not influence unfavorably the general condition of the patient but when their growth is not arrested they may seriously impair the extremity by their size. Roentgen examination of the limb reveals that usually the epiphyseal part of the bone is increased in size by a mass which is transparent or has the appearance of a honeycomb the bone presents a cortical layer formed by subperiosteal stratifications without reaction of the periosteum and without involvement of the articular cartilage and even of the growth cartilage in children Biopsy is of the greatest importance for the differential diagnosis from bone dystrophies benign tumors malignant tumors and bone infections sections of tissue should be taken from every part of the growth The evolution of these tumors is benign but if left alone they may reach an enormous size Their prognosis is relatively benign from the point of view of the general health of the patient the typical cases heal well under the usual treatment (curettage or roentgen therapy) Reported cases of metastasis are due to incomplete or erroneous histological diagnoses and are from the beginning real osteogenous sarcomas or benign tumors in which malignancy has appeared after one or several curettages This shows clearly the importance of repeated histological examination in cases of recurrence in order to discover possible malignant degeneration and to apply the required treatment

In the treatment of giant cell tumors of the bone the method of choice is to empty the tumor cavity and to fill it with bone grafts or to cover it with an osteoperiosteal splint according to Codman's technique To avoid possible fracture in these cases a plaster cast is advisable Resect on or amputation from the beginning may be indicated in some special cases Roentgen therapy is in general very efficacious and indispensable in many cases in which the localization of the tumor makes surgical access difficult, as in tumors of the vertebrae and skull

RICHARD KEMEL MD

Ollerenshaw R The Femoral Neck in Childhood *Proc Roy Soc Med Lond* 1938 37 113

The author limits himself to the consideration of infantile coxa vara and hiped femoral epiphysis reporting observations chiefly from his work at the Hôpital Manche for Children's Hospital

He analyzed 16 cases of infantile coxa vara The clinical signs of this condition are (1) a rolling gait (2) lordosis especially in the bilateral cases (3) raising of the trochanters (4) loss of abduction and (5) complete absence of pain A striking feature was the smallness of stature of the patient

Radiographically the following conditions were found (1) a clear area in the neck of the femur quite distinct from the epiphysis and distal to it (Fig 1) (2) the presence of a fragment of bone in the lower part of the clear area the shape of this fragment being that of an inverted V (3) a short

and improved function of the knees was obtained in 60 per cent. Some of the most satisfactory and even dramatic results were seen in elderly patients with osteo-arthritis. In properly selected cases of non-specific proliferative synovitis of the knee, synovectomy offers a 95-per-cent chance of improvement and a 60-per-cent chance of restoration of a practically normal joint. Tuberculosis of the synovial membrane is a strict contraindication for synovectomy, regardless of how early the diagnosis is made.

Failures of synovectomy are due more to the improper selection of cases than to any other factor.

RICHARD J. BENNETT, JR., M.D.

FRACTURES AND DISLOCATIONS

Husfeldt, E. The Treatment of Malleolar Fractures. An Analysis of 140 Cases (Die Behandlung von Knoechelbruechen. Eine Nachuntersuchung von 140 Faellen). *Hosp-Tid*, 1938, p. 717.

From 1926 to 1934, 165 malleolar fractures were treated in the Odense Hospital. Of these 140 were observed for at least two years, with roentgenograms of both ankles. Of the 165 cases, 127 were treated with plaster casts, 30 with pillow rolls and massage, 2 with calipers, 3 with traction, and 3 with bone grafts. Walking calipers were not employed since they did not give satisfactory immobilization of the reduced fracture and inclined toward displacement. Reductions and the application of casts were accomplished as quickly as possible if the bone displacement was considerable, otherwise, one waited until the swelling had entirely subsided. The cast was cut out over the ankle joint so that dorsiflexion could be obtained. Special attention should be paid to the eventual absence of tibiofibular syndesmosis with resultant separation and lateral displacement. Normally this separation is not more than 5.5 mm if the roentgenogram is taken at a distance of 70 cm. A reliable method for demonstrating the separation is by means of comparative roentgenograms of both feet. Another method shows the lateral displacement in the ankle joint, if bilateral films are taken simultaneously. A defective syndesmosis was found in 42 cases, reduction in such cases was often unsatisfactory. If the displacement is greater than 2 mm there is danger of the development of an unstable joint, in such cases a longer period of immobilization or bone graft is indicated.

Pseudarthrosis of the medial malleolus was considered especially. This developed most frequently during treatment with a walking caliper, which afforded insufficient immobilization of the fracture. It was also shown that in posterior fracture-subluxations retention in a plaster cast was frequently not possible, because of the marked disalignment. The end-results in the cases followed up were rated as 84 per cent good, 11 per cent fair, and 5 per cent poor. The chief causes of poor results were unsatisfactory reduction of the fibula, too early weight-bearing, especially with poor reduction and in heavy

patients, fostering a secondary displacement, and inaccurate treatment of posterior fracture-subluxations. Weight-bearing was advised only after a minimum of eight weeks of treatment, and only after ten weeks if the tibiofibular syndesmosis was defective. In posterior fracture-subluxations traction should be applied for from four to six weeks, which should be followed by a plaster cast, weight-bearing on the foot should not be permitted before ten or twelve weeks. Unsatisfactory reduction makes bone grafting necessary, providing there is no local or general condition which contraindicates surgery.

(HAGEN) JEROME G. FINDER, M.D.

ORTHOPEDICS IN GENERAL

Berti-Riboli, R. The Tolerance of Bone to Metals Used for Osteosynthesis (Sulla diversa tolleranza dell'osso verso i metalli usati nelle osteosintesi). *Ann. ital. di chir.*, 1938, 17, 827.

The author studied the influence of metal on osteosynthesis in rabbits and dogs. For this purpose the radius was exposed under aseptic conditions and plates made of various metals were attached to intact or fractured bones. The electromotive power of the metal was determined by means of a potentiometer able to measure potentials of one millivolt. Strong catgut was used for immobilization of the plates. Particular attention was paid to preservation of the integrity of the ulna in order to assure perfect apposition of the fragments of the radius and to prevent their displacement.

The higher the electromotive power of the metal, the more harmful the effect. The following figures express the above mentioned power: brass 380 mv., aluminum 310 mv., non-oxidizable steel 180 mv., steel-vanadium alloy 144 mv., duraluminum 110 mv., 20-carat gold 74 mv.

An ideal metal plate should be inactive biologically for perfect asepsis, mechanically for correct fixation, chemically (not subject to oxidation), and physically (maintaining the iso-electric conditions).

When in contact with living tissues, the electrochemical potential of the metal progressively diminishes because it has a tendency to establish iso-electric conditions similar to those in the surrounding tissues. Therefore, the smaller the original electrochemical potential of the metal, the better it is tolerated by the tissues. The velocity with which the metal tends to establish iso-electric conditions constitutes the index of its toxicity. The latter is in direct proportion to the anatomopathological alterations in the tissues. In addition to individual differences in the tolerance of the tissues toward the metals there is a zoological specificity, various species responding in a different manner to the same metal.

It may be generally stated that a metal plate of any kind retards the consolidation of a fracture. For the preparation of plates only metals with a low toxicity, i.e. a low electromotive power, should be selected.

JOSEPH K. NARAY, M.D.

vary first to consider a definite period of observation of the characteristic course of tuberculosis then the question can be answered as to as to which treatment preserves the greatest function. However the consideration of functional results need not decisively influence the surgeon in his choice of a method of therapy.

In heliochlorinotherapy it is of greatest advantage to provide a change of climate that will be most beneficial to each reaction phase of the disease by this method the optimum effects may be anticipated. Ultraviolet rays and Vitamin D regulate the calcium and iodine metabolism their use is contraindicated during a course of heliochlorinotherapy. One must beware of cumulative effects.

Operative therapy includes chiseling out and excision of tuberculous foci particularly in an isolated extra articular location. Resection should not be performed in patients under thirteen years of age and in adults only if the process progresses despite pertinent treatment. Amputation should be performed only as a vital measure. Arthrodesis of a joint should imitate the natural course of healing (fusion by bone graft in spondylitis arthrodesis is in contraindicated). Orthopedic measures (rest cure plaster cast traction) may be combined profitably with heliochlorinotherapy. Roentgen irradiation deserves serious consideration along with orthopedic measures in the ambulatory handling of surgical tuberculosis although it is not suitable in all forms it is contraindicated in the acute phases and in severe generalized tuberculosis. Medicaments include Vitamin D calcium and iodine given either by local injection according to Hotz or by mouth. The prescribing of iodine must be regulated according to the status of the thyroid gland. From the dietary standpoint a nourishing mixed diet with an abundance of fruits and vegetables is indicated. The Ger on Sauerbruch Hermannsdorfer diet has not justified its continuance.

Systematic aspiration of an abscess should not be performed except when the abscess is enlarging. In resection therapy has only a limited sphere. The individual localization of surgical tuberculosis and their treatment were briefly considered. In regard to bone graft transplantation Saeger observed that on principle the procedure should not be discarded that its field of application according to the experience of recent years must be strongly limited and that it may perform some good in a restricted choice of cases. (DEUTSCH) JEROME G. FINER MD

Inge G. A. I. Chronic Synovitis of the Knee Joint Treated by Synovectomy J. I. W. J. 935
1: 2457

It was found that in order to obtain a successful result from synovectomy the following rule must be adhered to closely: (1) the operation should be performed only in cases of non-purulent arthritis and should be localized to the synovial membrane (2) all foci of infection should be removed if feasible (3) conservative treatments should be given adequate

trial. A considerable effusion within the joint is also necessary for a good result and the disease should be confined to one or at most to two joints in addition all acute inflammation should have subsided.

This study is based on the results of 80 complete synovectomies of the knee joint. The average follow-up period was five and six tenths year none being shorter than six months.

Synovectomy was performed on 6 cases which proved to be due to tuberculosis. Three other cases turned out to be hemangioma gonococcic arthritis and osteitis respectively. Operations were performed on 58 cases and in 19 of these bilateral synovectomy was done. There were 26 cases of rheumatoid arthritis 20 cases of osteoarthritis and 31 cases of chronic proliferative synovitis.

The erythrocyte sedimentation rate for determining the activity of the arthritis has been found very valuable in the prognosis of the synovectomies. It was found to be more accurate than ordinary physical and roentgenographic examination. Eighty-five per cent of the operations in patients with a normal sedimentation rate gave satisfactory results while only 60 per cent in patients with elevated sedimentation rates gave satisfactory results. It was found safer to use conservative anti-arthritis treatment to reduce the sedimentation rate before synovectomy.

The operation was performed by 23 surgeons. Two vertical parapatellar incisions were usually made and the synovial membrane was completely excised. The infrapatellar fat pad was removed routinely. The good results obtained in 8 cases in which the menisci were left in place would seem to contradict the opinion that menisci should be removed in synovectomies.

Traction was applied to the leg postoperatively for from one to two weeks in 12 cases but the final outcome was no different in these cases from that when traction was not applied. Gentle passive and then active motion was begun in the knee joint within forty-eight hours after operation. In none of the 80 cases did instability develop as a result of the operation.

No matter what the etiology of the particular case and regardless of the final result at the operation pathological change in the synovial membrane were basically the same in all cases. The pathological picture consisted fundamentally of hypertrophy and hyperplasia of the synovial layer of cells so that this membrane was thrown into large folds and redundant fold and there was a thickening of the sub-synovial layer by edema fibrous engorgement of the blood vessels and scattered foci of round cell infiltration.

Sixty-one per cent of the patients with rheumatoid arthritis were benefited symptomatically by the operation and only 44 per cent were benefited functionally. In many cases the condition may become clearer after operation. In osteoarthritis of the knee symptomatic relief was obtained in 100 per cent of the cases.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Uggeri, C, and Massone, A The Arterial Symptomatology of Phlebitis of the Extremities (La sintomatologia arteriale delle flebiti degli arti) *Arch ital di chir*, 1938, 49 429

Arterial symptoms of more or less sudden and more or less intense ischemic type may occur in association with thrombophlebitis of the extremities. The cases reported in the literature up to the present time are rather limited in number, but it is probable that the phenomenon is not as rare as would appear from the number of reported cases. The authors have divided these cases into three groups, to each of which belongs 1 of the 3 cases they have observed and now describe.

In the first group are found the cases in which the ischemic symptoms appear with or after the occurrence of phlebotic signs, these symptoms may be caused by an organic involvement of the artery due to the action of the same cause that has produced the phlebitis, or to a spastic factor, or to the association of these two elements. Theoretically, the arterial spasm may be determined by the influence of the arterial as well as of the venous changes, and in general it is practically impossible to establish a distinction between these two factors. In this first group of cases, the ischemic symptoms have never appeared suddenly and have seldom reached such a degree as to cause gangrene.

In the second group are classified the cases in which the symptoms of circulatory deficiency have appeared suddenly to such a degree as to simulate more or less markedly the presence of an arterial embolism. This accident is determined by an extensive thrombosis of the principal vein of the extremity as an arterial spastic reflex caused by the sudden arrest of the return circulation. In these cases the arteries have been found to be practically without pathological changes, therefore, the reflex seems to be exclusively of venous origin and is explained by the results shown by experimental investigations on the consequences of the ligation of the principal vein of an extremity.

In the third group may be included the arterial reactions of the same type as those of the preceding group, but less sudden and less intense. Although systematic observations have been made only exceptionally, it is probable that such arterial spastic reactions of moderate degree are far from being rare in phlebitis.

These arterial reactions may be interpreted as resulting from increased pressure and decreased afflux to equilibrate the impeded return circulation. The diagnosis is easy in the cases belonging to the first and third groups, but confusion with embolism may arise in the second group, in these cases, the most important distinctive characteristic is the primary

appearance of a cyanotic pallor instead of the waxy pallor of the embolic syndrome. The treatment naturally consists of all those measures that may abolish the arterial spasm, these include before anything else the use of acetylcholin and eupaverin, which seem to be the substances from which the best results can be expected. In case of failure of these treatments, recourse may be taken to sympathetic novocainization and, especially in the forms which tend to be protracted, to perarterial sympathectomy and to resection of the obliterated venous segments. Removal of the venous thrombus in the acute syndromes, which would appear to be the ideal treatment, requires further experimentation to determine its probabilities of success.

RICHARD KEMEL, M D

Homans, J Postoperative and Posttraumatic Thrombophlebitis of the Lower Limbs and Its Complications *J internal de chir*, 1938, 3 599

The author presents herewith a discussion of such causes of thrombophlebitis as seem at the present time to be most significant, particularly from the point of view of the prevention of both thrombosis and pulmonary embolism. These causes include retardation of the venous return, depletion of the circulation, the effect of trauma (both in the form of operation and accidental injury), and perivascular inflammation affecting the iliac and femoral vessels.

Evidence is introduced to show that elevation of the legs above the head tends to forestall thrombosis and, in case thrombosis has occurred, to prevent the formation of the dangerous, fragile, propagating thrombus.

In the discussion of the effect of trauma, which is spoken of as the "X" factor, attention is called to the apparently general agreement that this factor does its work early, so that treatment directed against it must be instituted immediately after the operation or injury.

Perivascular inflammation, both in its early and late stages, is described. It is held to account for the arterial spasm which so often ushers in a femoro-iliac thrombophlebitis, the common phlegmasia alba dolens. The cause of this perivascular inflammation, which is by no means essential to thrombosis, is unknown. The suggestion is offered that it occasions a thrombosis less likely to lead to pulmonary embolism than the quieter processes, that is, those which excite less pain, cyanosis, and edema. Perivascular inflammation should be studied further and will repay investigation.

Pulmonary embolism, when fatal, is due to the detachment of a long, fragile, clot-like fragment from the original thrombus which has become propagated in the direction of the heart. Since this propagated thrombus gives no sign of its presence before detachment, unless by the pulmonary infarction of minor embolism, its elimination (by proximal

Pierangeli L. First Results of the Administration of a New Chemical Preparation for the Cure of Surgical Tuberculosis (*Primi risultati dell'applicazione di un nuovo preparato chimico per la cura della tubercolosi chirurgica*) *Arch ital di chi* 1938 49 301

Rubrophen a new chemical preparation for the cure of surgical tuberculosis has been tried with good results in the Clinics of Budapest for the past two years. It is the sodium bisulfite of dioxytrimethoxy orytrithane and consists essentially of a peculiar combination of guaiacol and iodoform. The preparation is offered under three forms: powder to be dissolved in distilled water at the time of injection in the dose of 0.3 gm; keratinized tablets containing 15 gm of the substance and lanolin ointment containing 15 per cent of the drug. The best method of administration includes 3 intravenous injections per week alternating with the ingestion of from 4 to 6 tablets three times per week; no treatment is given on the seventh day and all treatments are taken in the morning on a fasting stomach. The injections cause no damage to the vessels but extravasation of some drops of the solution produces pain in the arm which responds promptly to the application of hot wet compresses. The drug does not accumulate in the organs; it is eliminated completely in from forty-eight to seventy-two hours imparting to the urine an intense red color which changes to blue on the addition of a base. The drug is well tolerated by the patient but in a certain percentage of cases the tablets cause gastro-intestinal disturbances which disappear promptly when the dose is decreased. Contra-indications are cardiac lesions, amyloidosis and pregnancy. In about 20 per cent of the cases the first injections cause a slight rise of temperature and in these cases healing is more rapid. After the first injections the patient has a feeling of general well-being and his appetite returns; he gains weight and often his temperature becomes normal. Locally

there may be some exacerbations after the first injections especially in the case of visceral tuberculosis. The painful symptoms disappear in tuberculosis of the bones and joints; the secretion of the fistulas changes rapidly and decreases notably; the fistulas close; abscesses are resorbed and recalcification of destroyed bone takes place. The glycaemia and azotemia do not undergo any pathological changes; the cholesterolemia increases slightly and progresses slowly; the red blood cells and the hemoglobin increase to normal; the leukocytosis decreases and the leukocyte formula returns to normal in two or three months.

Pierangeli has treated 34 patients with rubrophen: 21 of whom had tuberculosis of the soft tissues and 13 tuberculosis of the bones and joints; 30 were clinically cured and 4 obtained no benefit from the treatment. A focal reaction was observed in 3 patients; 2 of whom had tuberculosis of the bones and 1 epiphyseal. General reactions occurred in 4 patients but soon disappeared. The duration of the treatment of tuberculosis of the soft tissues was from three to five months and that of tuberculosis of the bones and joints from eight to twelve months; the average treatment of the former required from 30 to 40 injections and the ingestion of 250 tablets while that of the latter from 60 to 70 injections and the ingestion of 500 tablets. Usually the treatment was given in periods of from two to two and one-half months with intervals of from two to three weeks. In cases treated surgically pre-operative and postoperative treatment favored healing and cure was obtained without fistulas. In patients presenting liquefaction of tuberculous foci pus was aspirated in the usual manner but the drug was never injected into the sinuses in order to avoid pain. The 4 patients who were not benefited by the treatment were 2 with spondylitis, 1 with lateral cervical lymphoma and active pulmonary complication and 1 with chronic tuberculosis of the knee who did not take continuous treatment.

Richard Kruhl, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Uggeri, C., and Massone, A. The Arterial Symptomatology of Phlebitis of the Extremities (La sintomatologia arteriale delle flebiti degli arti) *Arch ital di chir*, 1938, 49 429

Arterial symptoms of more or less sudden and more or less intense ischemic type may occur in association with thrombophlebitis of the extremities. The cases reported in the literature up to the present time are rather limited in number, but it is probable that the phenomenon is not as rare as would appear from the number of reported cases. The authors have divided these cases into three groups, to each of which belongs 1 of the 3 cases they have observed and now describe.

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division of the great vein in which it has formed) is rarely practical. Promising method of its prevention are being devised but as yet none have reached the stage of proved efficiency.

Postphlebitic induration and ulceration the late complications of phlegmasia alba dolens are described and pictured. This condition is very intractable to treatment. Division of the sensory nerve supply to the ulcerated area not only relieves pain but actually raises the local surface temperature and so encourages healing. The treatment most often required is radical excision with a skin graft which to be permanently successful must include removal of the muscular aponeurosis. If this excision is carefully performed sepsis is so little to be feared that an immediate graft can be applied. The results are permanent and remarkably satisfactory.

HERBERT F. THILSON M.D.

BLOOD TRANSFUSION

Bondarenko A. The Experimental Use of De-fibrinated Blood (Anwendungsergebnisse von de-fibriertem Blut). *Chir. g. ja* 1938 1 48

The author surveys the literature concerning the transfusion of defibrinated blood in which the work of the Russians Filomatitskiy and Sutugin done one hundred years ago is included. Particularly notable is Sutugin's account concerning the value of defibrinated blood preserved by cold for as long as seven days.

The work of the author had to do with the experimental as well as the clinical field. He was convinced that in guinea pigs rabbits and dogs the latter receiving up to 250 ccm. at one time defibrinated blood transfusion was harmless.

Then he investigated the thrombin content of defibrinated blood after varying periods of preservation and was able to prove that this content decreased progressively to become null after twenty-four hours at room temperature. In order to decrease the danger of clotting the author advises that freshly defibrinated blood not be used; it should be preserved for at least one hour. The defibrination is done in a broad mouthed vessel with a glass stirring rod and should take at least ten minutes.

The author performed 102 transfusions of defibrinated blood upon 57 men of the same blood group. Chills or rises in temperature were not observed. The therapeutic effect of the transfusion agreed with what one expects from a citrate transfusion. In the great majority of the author's observations it was a question of various blood diseases: leucemia lymphogranulomatosis pernicious anemia and others. A rise of the hemoglobin and a lowering of the leucocyte count were seen in leucemia yet without alteration of the differential count.

One death troubled the author's experience. From 200 to 300 ccm. of blood were infused repeatedly without harm while in this case barely 40 ccm. were infused and this was done during an attack of cardiac

weakness in the case of a myeloid leucemia. The sex and age of the patient were not given. The blood had been stored three hours. At autopsy a very marked pulmonary edema and a large heart were found. Nevertheless the author believes that the infusion of defibrinated blood which has been stored for at least one hour is harmless.

(N. PETROV) THOMAS C. DOUGLASS M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS

Giornelli L. Traumatic Rupture of the Thoracic Duct (Rottura traumatica del dotto toracico). *Ann. Ital. di chir.* 1938 17 775

The occurrence of traumatic rupture of the thoracic duct is rare.

The author observed one such case with a fatal outcome thirteen days after the accident. The autopsy revealed a complete rupture of the thoracic duct at the height of the tenth dorsal vertebra with an extensive laceration of the parietal pleura in the corresponding region and chylothorax on the right side.

After a repeated thoracocentesis the patient felt well but suddenly on the thirteenth day he became dyspneic and cyanotic and death ensued.

A correct diagnosis is impossible without an exploratory aspiration. In the majority of cases reported in the literature the chylothorax developed between the second and the fifth days after the injury. Sudden cyanosis dyspnea anxiety profuse perspiration and a rapid weak pulse must be ascribed not only to the pressure but probably also to toxic phenomena. Absence of fever is of value in the differential diagnosis from chylothorax traumatic serofibrinous pleurisy and hemothorax. Chylothorax is characterized by an abundance of effusion.

Of the various therapeutic measures the author prefers repeated aspiration to thoracotomy or pneumothorax.

JOSEPH K. NARAT M.D.

Durand H. Costenot P. and Mamou H. Ulcerative Cutaneous Forms of Hodgkin's Disease (Les formes cutanées ulcéreuses de la maladie de Hodgkin). *Presse Méd. Par.* 1939 46 723

Durand and his associates note that about 50 cases of Hodgkin's disease with ulcerative cutaneous lesions have been reported in the literature but they are of the opinion that such lesions would be found more frequently if careful histological examination were made.

Ulcerative cutaneous lesions may be the first symptom of Hodgkin's disease in which case the diagnosis is difficult and indeed impossible without biopsy. As a rule however the clinical syndrome of Hodgkin's disease is well developed when the cutaneous lesions appear. The lymph glands are enlarged not only in the region of the cutaneous lesion but elsewhere in the body and also such symptoms as splenomegaly pruritus fever and changes in the blood may be present and definitely establish the

diagnosis The cutaneous lesion may result from the enlargement of a gland, which becomes inflamed and adheres to the skin until the skin breaks down, forming an ulcerative lesion, or the lesion may be primarily cutaneous, of the type of a neoplasm or lymphogranulomatous infiltration, which progresses to ulceration While these cutaneous lesions of Hodgkin's disease may be found anywhere on the face or body, the most frequent site is the anterior thoracic wall, such lesions may also be multiple

These ulcerative cutaneous lesions are usually round or oval with regular outlines, but they may be of irregular shape Their edges are usually thickened, the base is gray, sometimes bleeding, and suppurating, in some cases there is a fetid odor In some cases they present the appearance of an ulcerating neoplasm These lesions are sometimes very painful and sometimes only slightly so They are usually resistant to roentgenotherapy Death of the patient usually occurs in from four to eight months after the appearance of the cutaneous lesion either from progressive cachexia or from some complication of the lymphogranulomatosis There are exceptions to this rule, however, Grossmann and Schliemer have reported a case in which the cutaneous lesions healed rapidly under roentgenotherapy The authors report also a case in which the cutaneous lesion healed in two months and other symptoms of the disease were much relieved by roentgenotherapy

While the appearance of the ulcerative cutaneous lesions of Hodgkin's disease may closely resemble that of ulcerating epithelioma (ulcus rodens), this type of epithelioma is found usually on the face, and while the regional glands may be involved, there is

no involvement of other glands, as in Hodgkin's disease If the cutaneous lesion is the first symptom of Hodgkin's disease, biopsy is necessary for a definite diagnosis The lesions of mycosis fungoides simulate the cutaneous lesions of Hodgkin's disease very closely, and some authorities maintain that they are identical Histological examination, however, shows certain differences

In the case reported by the authors, there was an ulcerative lesion on the anterior thoracic wall, which resembled an ulcerating epithelioma However, the diagnosis of Hodgkin's disease was established by the enlargement of the subclavicular and axillary glands, roentgenological demonstration of a mediastinal mass, the blood count, and marked weakness and pallor The cutaneous lesion healed, the subclavicular, axillary, and mediastinal glandular enlargements almost completely disappeared, and the patient's general condition improved under roentgenotherapy

A biopsy of a specimen taken from the border of the cutaneous ulcer before treatment was instituted showed numerous Sternberg cells, characteristic of lymphogranulomatous lesions The authors maintain that the lesions of mycosis fungoides are distinguished from the cutaneous lesions of Hodgkin's disease chiefly by the presence of the mycotic cells, which are smaller and less differentiated than the Sternberg cells, the reticular network is also less developed in mycosis fungoides These two lesions are undoubtedly closely related pathological conditions, probably of the same origin, and belonging to the same group of reticulo-endothelioses

ALICE M MEYERS

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Devine Sir H A Review of the Acute Postoperative Circulatory Disturbances *J. of the American Medical Association* 1938 8 145

In considering circulatory disturbances following severe operations the author distinguishes between (a) the patient who has a normal circulatory mechanism and (b) the patient who starts out with some crippling of his circulation either cardiac or peripheral. A pre-existing circulatory crippling may introduce a large element of cardiac failure into a postoperative circulatory disturbance which might be regarded as a pure postoperative shock. From a therapeutic standpoint this is important because the treatment of these conditions is diametrically opposite.

Postoperative circulatory disturbance in patients with a normal circulatory mechanism shock (sometimes called collapse)

Shock has many causes for example trauma, toxemia, anaphylaxis, hemolysis and even psychic disturbances. These all give rise to a similar clinical picture: a sudden circulatory exhaustion manifested by pallor, sweating, rapid pulse, rapidly falling blood pressure, increased respirations and apathy.

The author discusses two forms of shock: (1) that which appears during or immediately after operation and which seems to have a neurogenic basis, and the form which comes on secondarily possibly because of some circulating toxic product or perhaps a sudden disturbance in the blood clotting system.

Neurogenic shock can to a certain extent be avoided by careful handling of the tissues during the operation and the judicious administration of the local or general anesthetic. It is sometimes wise to anticipate the onset of shock by an intravenous infusion during or at the end of the operation.

The treatment of postoperative shock in a patient whose circulatory system can be regarded as healthy is based on the following principles:

1. The blood vessels must be filled to compensate for the plasma loss and for the decrease in the amount of circulating blood. The author recommends a continuous drip infusion of from 8 to 10 per cent glucose in saline solution (Tyrode or Ringer) of approximately the same chemical composition as that of the plasma. A blood transfusion may be given if necessary.

2. The peripheral vascular system must be toned up; that is, contraction of the peripheral vessels must be stimulated. For this purpose the action of adrenalin has been found to be too evanescent. Recently however several brands of synthetic adrenalin have been produced: symphatol and synephrin hydrochloride. The former may be administered directly in the intravenous dextrose drip.

3. The breathing center must be stimulated in order to hasten the circulation of the blood. Five per cent carbon dioxide in oxygen may be administered intermittently. When the breathing center is severely depressed lobelia should be added to the intravenous drip solution.

Postoperative circulatory disturbances in patients with a crippled circulatory mechanism

A study of the literature reveals that between 10 and 15 per cent of postoperative deaths are caused by a circulatory disturbance for which a pre-existing lesion of the heart is mainly responsible. Frequently this lesion may not be recognizable by means of the usual clinical examination. The diagnosis of how much peripheral vascular failure and how much cardiac failure play a part in a postoperative circulatory disturbance is important for the principles of treatment of the cardiac failure component are diametrically opposed to those underlying the treatment of the peripheral vascular failure which is responsible for true shock.

The author discusses the differential diagnosis of postoperative peripheral circulatory failure (shock) and cardiac failure: the manifestations of the two conditions are the opposite of each other. In cardiac failure the blood pressure is usually not low, the venous pressure is high, the arm and neck veins are distended, the liver may be palpable, there are urobilinogen and albumin in the urine, the cheeks are not sunken as in shock, nor the eyes so deep set. The patients desire to sit up, there is an increase in the amount of circulating blood and not nearly so much decrease in the systolic output as in peripheral vessel failure (shock). It must however be understood that in some cases cardiac failure may be secondary to a vascular insufficiency and may be the result of an insufficient amount of blood offered to the heart by the peripheral circulation which results in an insufficient supply of blood to the coronary arteries and causes a definite injury to the cardiac muscle.

Treatment of cardiac failure Cardiac stimulants which are suggested include caffeine, camphor, coramine, digitaline and strophanthine. Mechanical aids to the circulation are also advised. These are: (a) abdominal pressure (abdominal bandage or corset), (b) abdominal respiration, (c) stimulation of intestinal peristalsis and (d) the upright position as soon as possible.

SAMUEL H. KLEIN, M.D.

Winslow S. B. Dextrose Utilization in Surgical Patients *Surgery* 1938 4 867

The author studied 27 surgical patients for periods of from 120 to 120 days in an attempt to evaluate the relative merits of the parenteral administration of 5 and 10 per cent dextrose solution. Eighteen patients received the 5 per cent dextrose, 4 received the 10 per cent solution and 5 received both the 5

and the 10 per cent solutions. Whenever possible a timed intravenous pump was used to obtain accurate control of the amount and velocity of injection of the dextrose solution. Each patient was weighed daily. Urine specimens were obtained hourly whenever possible, and examined immediately for dextrose content. The total intake and output of fluids were measured daily, and the temperature was recorded every four hours.

Glycosuria, which was present to some degree in all cases, always was maximum on the day of operation, markedly less on the first postoperative day, and, with rare exceptions, again decreased abruptly on the second postoperative day. The degree of nutrition proved to be an important factor affecting the patient's ability to utilize dextrose, and patients in a state of good or fair nutrition exhibited less glycosuria than those in a state of poor nutrition. Eight patients were given glucose intravenously, or high carbohydrate diets, prior to operation for a period of from two to nineteen days. These patients exhibited more efficient utilization of the dextrose administered after operation than the average patient. These findings were in agreement with those of Colwell who stated that the ability of the normal mammalian organism to utilize dextrose is diminished by starvation and enhanced by the administration of sugar.

There was no marked variation in the utilization of dextrose according to the type of operation or anesthesia, except that the simpler procedures were accompanied by less postoperative glycosuria as a rule than the more serious ones, and increased glycosuria usually occurred in patients having a long inhalation anesthesia. In the group receiving 5 per cent dextrose, 3 patients with fever from 101 to 102 degrees showed a glycosuria above the average for the group. However, all 3 of these patients were in a state of poor nutrition. In the group receiving 10 per cent dextrose, 2 patients with fever from 101 to 103 degrees had marked glycosuria, but both were noted to have been in good condition pre-operatively. The finding of diminished dextrose utilization in the presence of fever was contrary to those of Hendon and of Allen, both of whom reported increased consumption of glucose during fever. The severity of glycosuria varied with the type of disease, but appeared to be influenced more by the state of the patients' nutrition than by any other factor.

Although poor nutrition, fever, the severity of the disease, duration and type of anesthesia, and pre-operative preparation produced variations in the degree of glycosuria, the rate at which the dextrose solution was administered proved to be the most important factor affecting its utilization. Five per cent dextrose in distilled water was given to 19 patients at the rate of from 300 to 500 c cm an hour, the average intake totalling about 3,000 c cm daily. Fifteen of the 19 patients exhibited glycosuria of insignificant degree, the average amount of sugar appearing in the urine being only 1.5 per cent. Thus only 2.25 gm of a daily average intake of 150 gm of

glucose was not utilized. No patients exhibited dehydration, water retention, unusual diuresis or other effects when given glucose at the rate described above, which was equivalent to 0.35 gm per kgm of body weight hourly.

Of the patients given 10 per cent glucose, all had glycosuria. The rate of administration approximated from 300 to 500 c cm an hour, the average intake totalling around 3,500 c cm daily. The actual amount of glucose in the urine was small, the average being only 5.15 per cent of the daily intake. The administration of 10 per cent dextrose at the rate described is the equivalent of 0.6 gm per kgm of body weight per hour.

The study favors the use of 10 per cent dextrose in distilled water in sick surgical patients whenever a high caloric or high carbohydrate intake is desired. The patients given 5 per cent glucose utilized 147.75 of the average daily intake of 150 gm, while those given 10 per cent glucose utilized 284.5 of the average daily intake of 300 gm. The caloric value of the latter daily intake is in the lower range of the caloric requirement of a resting surgical patient without fever or severe infection, while the caloric value of the 3,500 c cm of 5 per cent glucose administered to patients in the other group is far below the basal energy need.

In conclusion it appears that the routine use of 5 per cent dextrose in distilled water is to be recommended for patients who require water and some carbohydrate parenterally. It is isotonic with blood. Its dextrose content is sufficient to prevent ketosis and to provide ideal fuel for energy. It protects the liver and prevents the edema which may result from the promiscuous use of sodium chloride. No serious complications, such as dehydration, diuresis, or unusual loss or retention of fluid, have been noted when 3 liters are given daily at the rate of from 300 to 500 c cm per hour. This amount represents an inadequate caloric intake, but this is not an important objection in patients with fair general nutrition, or in those who will be taking food by mouth in a few days. Ten per cent glucose in distilled water is hypertonic with blood, is mildly diuretic, and can be given at the same rate as 5 per cent glucose without harmful effects. It supplies the patient with 93 per cent more carbohydrate than an equal volume of 5 per cent dextrose. This rate of utilization makes it the choice of the author in the presence of liver damage, thyroid crisis, inanition, and cachexia.

ARTHUR S. W. TUROFF, M.D.

ANTISEPTIC SURGERY, TREATMENT OF WOUNDS AND INFECTIONS

Klauder, J. V. Erysipeloid as an Occupational Disease. *J. Am. M. Ass.*, 1938, 111: 1345.

A clinical analysis is made of 100 cases of erysipeloid due to the organism of swine erysipelas. Eighty-eight of the patients were infected through an injury to the hands in the course of employment. In 58 cases the abattoir was the source of infection,

in 11 the retail fish market and in 7 the tallow grease or fertilizer industry in addition 6 veterinary students were infected while dissecting a horse

The most virulent infections were contracted from the fish source Clinically a mild rather localized cutaneous infection was the rule a purplish red color of the erythema was characteristic The lesions were rarely generalized at times the picture of an acute septicemia with arthritic manifestations was presented In many of the cases observed the course appeared to be self limited The usual duration was about three weeks Relapse occurred in 6 cases

In the treatment of this disease heat and rest are important The constant application of wet dressings of 1 per cent ichthammol in alcohol is recommended Repeated erythema doses of ultraviolet ray seemed to be effective Serum is indicated if the infection persists one month if it progresses rapidly or if arthritic symptoms are prominent

WALTER H. NADLER, M.D.

Policchetti E. Apyretogenic Resolutive Autolysates of the Staphylococcus and the Streptococcus in Surgical Infections (Gli autolisi risolutive apyretogeni dello staphilococco e streptococco nelle infezioni chirurgiche) *1. ch. ital. d. ch.* 938 49 367

In 42 cases of various surgical infections Policchetti has used the ultimate products obtained from staphylococci and streptococci by an autolysis of from sixty five to ninety days these were isolated by dialysis and dried in a vacuum at low temperature They contained from 0.12 to 0.14 mgm of nitrogen per liter when dissolved in sterile physiological saline solution

The intravenous route of administration was employed in 15 patients the intramuscular route in 22 and the mixed route in 5 In general the treatment lasted from eight to twenty days the intramuscular injections were given every day and the intravenous every other day beginning with $\frac{1}{3}$ or $\frac{1}{4}$ ampule and increasing gradually to 1 ampule In 38 cases the biological treatment supplemented the surgical treatment but in 4 cases the biological treatment was used alone The age of the patients ranged from two to seventy five years No anaphylactic inflammatory febrile or damaging disturbances were observed Under the action of the dialysate the bacteria circulating in the blood were reduced to the condition of saprophytes and were tolerated as such by the organism One hour after the injection Donaggio's phenomenon became positive in the urine which proved that there was an increase in the coloidal rate in the organism at that time and an activation of the element of the reticulo endothelial system Following a temporary leucopenia during the first hour the number of the white cells increased to reach its height about the sixth or the seventh hour after the injection and to return to normal in twenty four hours The increase involved the polymuclear neutrophil and the monocytes which doubled in number The action of the dialysate resulted in rapid decrease and disappearance of

the symptoms but had no prophylactic effect in the sense of preventing the occurrence of infection however when the dialysate was used at an opportune time it activated the defense mechanism against the first signs of the disease and was therefore a real abortive treatment

Experience shows that it is advisable to start the treatment with very small doses to be increased slowly up to an optimal dose (1 ampule) which should not be exceeded so as not to obtain a paradoxical effect Early treatment is necessary and daily injections may be given to subjects who show good tolerance Tolerance varies little in old people and in young children While the initial intravenous dose should be from $\frac{1}{6}$ to $\frac{1}{4}$ ampule $\frac{1}{4}$ or $\frac{1}{2}$ ampule may be given intramuscularly the results obtained by the two routes being generally the same The action of the dialysates is specific although not in an absolute sense their practical usefulness efficacy safety and superiority over ordinary vaccines should encourage their development and more general use

PICHARD KEMEL, M.D.

ANESTHESIA

Clark A. J. Aspects of the History of Anesthetics
Brit. M. J. 1938 2 1019

The discovery of anesthetics is the only pharmacological advance of major importance made in the nineteenth century that has reached mature development and therefore can be suitably treated from the historical standpoint

Modern pharmacology may be said to have begun with the introduction of anesthetics and indeed the only later events of comparable importance in the history of the science are the introduction of thyroid therapy and the discovery of salvarsan which respectively initiated the sciences of endocrinology and of chemotherapy

In 1844 Wells produced surgical anesthesia with nitrous oxide in 1846 Morton did the same with ether and in 1847 Simpson introduced chloroform

The essentials of modern anesthetic practice were therefore mastered almost within a year Many advances have been made since then but it will be generally agreed that ether nitrous oxide and chloroform are together more important than all other known agents

The discovery of the pharmacological actions and therapeutic value of nitrous oxide was made by Sir Humphrey Davy between 1798 and 1800 However Davy's brilliant researches bore no immediate fruit

Hickman made a series of attempts in 1824 to produce surgical anesthesia by inhalation of gases among which was nitrous oxide He certainly demonstrated the possibility of surgical anesthesia by the inhalation of carbon dioxide but the extent to which he investigated nitrous oxide is doubtful

Horace Wells a dentist of Hartford Connecticut saw one of the displays of laughing gas and on December 11 1844 arranged for the gas to be used upon himself and achieved the painless extraction of

a tooth under anesthesia. Apparently he had never heard of Davy's suggestion. Wells tried to demonstrate the use of gas at the Massachusetts General Hospital, but the demonstration was a failure, and the sensation attending the discovery of ether anesthesia two years later caused nitrous oxide to be neglected and forgotten. In 1863 Colton in New York popularized the use of pure nitrous oxide in dental operations, and in 1868 Edmund Andrews of Chicago showed the advantages of using nitrous oxide with 10 per cent oxygen, a method which Davy had investigated on animals nearly seventy years previously. Nitrous oxide was established in general use in Great Britain about 1870.

In view of the present importance of nitrous oxide this history is very extraordinary. It would appear that Davy established the possibility of anesthesia with gas and oxygen and that this invaluable discovery was completely neglected for forty years and its true value not established for seventy years, while in the intervening period the gas maintained a steady popularity in virtue of its power to produce a ridiculous intoxication.

The history of ether contrasts sharply with that of nitrous oxide. Ether was one of the earliest known of the synthetic organic drugs, and its synthesis was described by Valerius Cordus in 1546. In 1794 R. Pearson used it in the treatment of phthisis and suggested its further investigation. After a few trials at the Pneumatic Institute it was found to be serviceable as an anodyne. Apparently its intoxicating powers soon became fairly common knowledge. In 1818 a note believed to have been written by Michael Faraday was published, which pointed out that ether had intoxicating effects similar to those of nitrous oxide.

The medical profession was therefore fairly well acquainted with the intoxicant action of ether, and many persons probably knew that an excess of ether might lead to unconsciousness. In 1844 Jackson and Morton witnessed Wells's abortive demonstration with nitrous oxide, and in 1846 Morton used ether for the painless extraction of teeth. On October 16 he administered ether for a surgical operation in Massachusetts General Hospital. Morton was more fortunate than Wells, his public demonstration was a complete success, and the speed with which its fame spread round the world is truly remarkable.

On December 19, 1846, a tooth was extracted under ether in London, and two days later the drug was used for two operations performed by Liston at the University College Hospital, within a few days, the fame of ether had spread to Edinburgh and to Paris. J. Y. Simpson immediately (January 19, 1847) used ether to relieve pain during childbirth, and within three months it had revolutionized surgical practice in Great Britain.

The credit for the discovery of ether was a subject of prolonged inquiry and controversy, but the matter was well summed up by Jacob Bigelow in 1870, in a letter to Simpson (871): "As far as we know, he (Morton) is the only man, without whom anaesthetic

inhalation might have remained unknown to the present day."

The discovery of chloroform was the third outstanding event in the discovery of anesthesia. The trial of chloroform by J. Y. Simpson and his friends, and its successful use as an anesthetic for major operations at the Royal Infirmary of Edinburgh on November 15, 1847, are celebrated historical events.

Simpson also seems to have the honor of being the first to use anesthesia in labor.

Deaths from chloroform soon occurred, and the first case (January 28, 1847) happened to be typical. A girl of fifteen had one great toe successfully removed under ether, and two months later chloroform was given for the removal of the other toe. The patient died suddenly, within two minutes of the beginning of anesthesia. The occasional occurrence of sudden and wholly unexpected deaths of this type under chloroform naturally attracted much attention. The history of the investigation made upon this subject in the ensuing sixty years provides chastening reading for laboratory workers, because the early clinical observers at once divined the nature of the phenomenon, while the laboratory workers in later years were persistently at fault.

Deaths under chloroform attracted so much attention that committee after committee was appointed to investigate their cause, but the reports chiefly serve to provide a striking proof of the fact that committees are not an effective mechanism for the solution of scientific problems.

The discovery of ether and chloroform stimulated intensive research into the properties of other gases and volatile liquids. Flourens in 1847 described the anesthetic action of ethyl chloride as well as chloroform. In 1848 Nunneley investigated on cats the anesthetic action of numerous substances, and incidentally described the effects produced by a mixture of ether and an alcoholic solution of chloroform (A. C. E. mixture). Workers such as Nunneley, Snow, and Richardson examined the anesthetic properties of a wide variety of gases and volatile liquids. Some of these, such as ethylene, afterward became established. The general rule that "the good is the enemy of the best" came, however, into operation; nothing was found which showed a clear superiority over chloroform or ether, and research died down.

Continual minor improvements in technique were made, but there was extraordinarily little change until about 1923. Since that date new volatile anesthetics such as ethylene and cyclopropane have been introduced, intravenous anesthesia with sodium evipan has achieved great popularity, and a wide variety of methods of basal narcosis has been investigated.

With regard to methods of basal narcosis, it is interesting to note that the use of such substances as urethane and paraldehyde for this purpose was established as a routine method in physiological laboratories by the end of the nineteenth century. The long delay in application of these routine methods to anesthetic practice is remarkable.

The history of anesthesia after 1847 shows clearly one of the major difficulties attending therapeutic advance. The outstanding fact is that thorough familiarity with a technique makes for at least a 30 per cent difference in efficiency. If a person has mastered a technique it is not worth while for him to change to a new and unfamiliar one unless the change promises some big advantage.

There is a tendency to assume that because the pioneer advances were due to unco-ordinated individual enterprise this remains the best method. Although organization is of little service in promoting original thought yet there comes a stage of development when further progress can only be made by co-ordinated work. This stage has probably been reached in the development of anesthesia. To decide whether a new anesthetic constitutes a significant advance is a difficult task for not only must its usual action be determined but it is also necessary to know what chance there is of its producing some rare but unpleasant side action. These facts can only be ascertained by carefully organized large scale trials of new agents.

SAMUEL KAHN M.D.

Burford G. E. The Use of Inert Gases in Anesthetic Atmospheres: the Relationship to the Problem of Postoperative Pulmonary Complications. *Anesth & Analg* 1938 17 241

The subject is discussed under four headings. The author presents (1) a brief review of the work which establishes atelectasis as the important postoperative pulmonary complication (2) an explanation of how the deficiency of inert gases in anesthetic atmospheres favors the production of atelectasis (3) further confirmation of the harmful effects on the lung of breathing atmospheres containing insufficient inert gas tension as obtained from a review of the work done on animals placed in high oxygen atmospheres and by comparison of the pathology of this condition with that of massive anesthesia atelec-

tasis and (4) the characteristics of the specific inert gases—hydrogen, helium and nitrogen—which are available for the dilution of anesthetic mixtures.

In conclusion Burford believes that a new approach has been made to the problem of reducing pulmonary complications following surgery and anesthesia. For this purpose some slowly absorbable gas is routinely added to the anesthetic atmosphere to replace the inert gas in the air normally breathed but seriously lacking in the anesthetic atmosphere.

Eight cases of what is termed massive anesthesia atelectasis have been considered a leading new case reported for the first time.

Further proof of the necessity of employing inert gases in respired atmospheres is drawn from a review of the previous work done by others on animals placed in high oxygen atmospheres.

The idea that so called oxygen poisoning developing in high atmospheric pressure which has interested physiologists for many years may be simply a slowly developing atypical form of atelectasis occurring as a result of an insufficient inert gas tension in the respired atmosphere is strongly suggested.

Some of the various inert gases suitable for purposes here recommended have been separately considered.

Helium at present is considered the most valuable gas for this purpose. However hydrogen has by no means been eliminated as yet for this purpose or for some strictly controlled therapeutic purposes.

Finally an attempt has been made to discuss every established phase of the problem of postoperative pulmonary complications. In so doing no direct evidence has developed which is controversial to the primary assumption that a reduction in the incidence of postoperative pulmonary complications may be expected from these additions of inert gas with proper regard for all the other aspects of this broad problem of medicine, surgery and anesthesia.

CARL F. STEINKE M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Stumpf, P. Roentgen Kymography as a Diagnostic Aid *Radiology*, 1938, 31 391

The importance of kinetic phenomena in diagnosis is emphasized. The kymogram has an advantage over screen observation in as much as the record is objective, permanent, and of better visual quality. Further, visualization of the movements again, as a sensory impression, is possible. With experience in interpretation, pathological movements may be classified, and primary movement distinguished from secondary. To quote "Kymography has for its aim the making of more objective fluoroscopic observations, thus to bring into view processes of movements not recognizable by other means."

Slow, complicated movements are studied to best advantage with the aid of the kymoscope. Short, quick movements are more readily interpreted directly from the curves of the kymogram.

To illustrate the points mentioned above, illustrations are included to show movement curves of the heart, swallowing, the stomach, the pylorus, the small intestine, and the colon. In myocardial infarct there is a change in the ventricular wave in a limited area (Fig 1). In gastric carcinoma primary movement is absent at the site of the growth. Mucosal

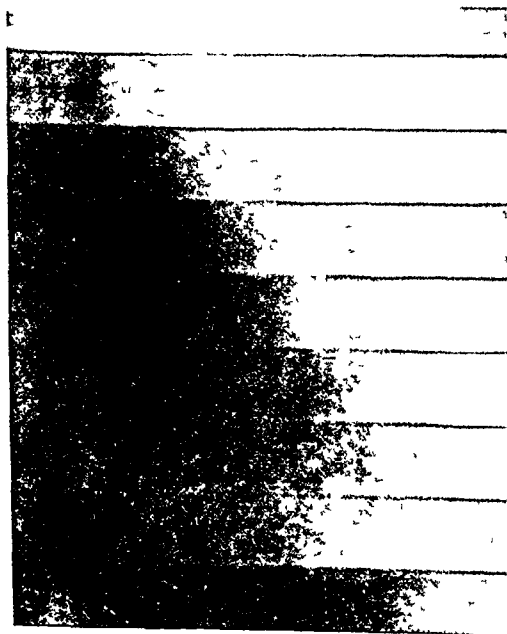


Fig 1 Section of the kymogram from the left ventricle

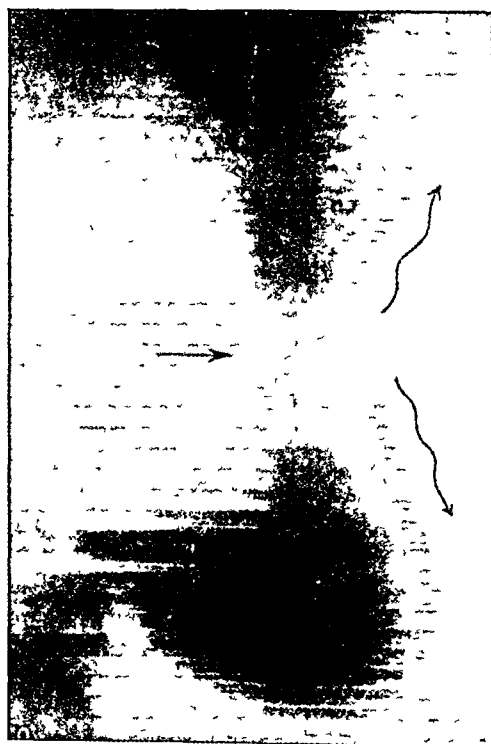


Fig 2 Ulcer of the posterior wall showing partial retroperistalsis in the segment of the ulcer. Arrow shows the ulcer.

relief is modified in gastritis. Retroperistalsis is observed in the presence of ulcer (Fig 2).

SYDNEY E. JOHNSON, M.D.

Westermarck, N. On the Roentgen Diagnosis of Lung Embolism. *Acta radiol*, 1938, 19 357

Acute embolism of the pulmonary artery or its branches may occur as a complication of many diseases as well as after operations. The clinical findings are briefly reviewed by the author who believes that minor emboli are of very frequent occurrence and often escape clinical diagnosis. He reviews the literature on the incidence of embolism. The roentgen manifestations found by other authors are described. The anatomy of the pulmonary vessels is reviewed, and comment is made on the fact that the arteries of the lower lobe of each lung divide finally into ventral and dorsal pairs. As a consequence of this distribution, obstruction of the arteries results in ventral or dorsal wedges in the lung, which are found to be best visualized in the lateral film.

The author made roentgenological studies of 26 cases in which embolism of the pulmonary artery was found at autopsy. In the majority the examination was carried out on repeated occasions and in all a chest film had been made within a fortnight of the patient's death. Ten of these 26 cases showed signs of lung infarction while the rest presented signs of more or less wide spread embolism without infarction. Seven of the 10 cases with infarcts showed sign of pulmonary embolism involving larger portions of the lung than were represented by the infarction observed. A study was made of the progress of emboli in 18 cases which had a clinical picture of pulmonary embolism. Seven of these showed roentgen evidence of infarction. 1 had evidence of infarction a fortnight later and 10 exhibited no roentgen evidence of infarction.

In uncomplicated cases of embolism of the pulmonary artery (cases without infarction) there was ischemia of the lung area corresponding to the obstructed artery. This ischemia at the peripheral side of the embolus or emboli appeared on the roentgenogram as a local and well defined zone of diminished density with diminished or absent vascularization. In an area corresponding to the site of the embolus and in the lung field central to this the vascular design was well maintained but seemed to stop abruptly. The zone of diminished density assumed the shape of a wedge with its apex directed toward the hilum and its base toward the periphery of the lung. The axis of the wedge passed obliquely forward or obliquely backward. The most satisfactory view to demonstrate this wedge appearance was the lateral or semi lateral projection although smaller wedges also appeared on anteroposterior films. Large emboli produced an anemia of an entire lobe or of one entire lung. This appearance of diminished density was clearly demonstrated in cases with pulmonary congestion. Such emboli without infarction may become organized and absorbed with reestablishment of the pulmonary artery circulation whereupon the vascular design again appears in the formerly transparent lung area.

Thrombotic masses may become deposited on a smaller embolus and cause it to enlarge in a central direction and produce an increase in the area of diminished density. Such a progress may lead to complete occlusion of the pulmonary artery with subsequent death. A continuous increase in the size of the anemic area of the lung generally indicates a poor prognosis.

In embolism of the pulmonary artery with infarction the radiological finding in a suitable projection was that of a wedge shaped massive homogeneous shadow. The apex of the wedge was directed toward the hilum and the base toward the periphery of the lung. In all of the author's cases the infarcts were located in the posterior portion of the lung and the base of the wedge was thus directed posteriorly. An anterior position may however occur particularly in infarcts of smaller size. The lateral or semi lateral projection is the most suitable for demonstration of these infarcts. Since infarction seems usually to occur in association with tamis of the pulmonary circulation there was usually demonstrated more or less pulmonary congestion. The congestive changes may wholly or in part obscure the infarct shadow and render its wedge shape indistinguishable.

A pulmonary infarct may become completely absorbed if the infarcted area is not too large and has not become subjected to complete necrosis. During this state of absorption there is progressively more aeration of the infarct. The usual occurrence however is that the infarct undergoes organization with the production of a reactive inflammatory zone surrounding this area. The wedge shape gradually disappears and the shadow assumes a more diffuse outline with cicatricial changes producing linear band shaped or narrow wedge shaped bands which radiate from the hilum to the periphery of the lung. In addition 7 of the 10 infarcted cases had al anemic areas of fair size with the vascular design absent or diminished in the peripheral lung but retained and terminating abruptly on the central side of these areas.

HAROLD C. OCHS, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Woskressenski, W M Late Results of the Treatment of Tetany and Spasmophilia in Adults by Subcutaneous Implantation of a Bone Fragment according to Oppel's Method (Résultats éloignés du traitement de la tétanie et de la spasmophilie des adultes par l'implantation sous-cutanée d'un morceau d'os selon la méthode de W A Oppel) *Rev de chir*, Par, 1938, 57 633

Woskressenski notes that Oppel's method of transplanting a fragment of bone in the subcutaneous tissues in the region of the pectoral muscle, below the nipple in men and below the breast in women, has been employed in 113 cases in the Kirov Institute of Leningrad in past years. In some of these cases the patients showed typical symptoms of spasmophilia and tetany, but in other cases the symptoms were not entirely typical, and in 6 cases the operation was done as a prophylactic measure, as damage to the parathyroids at the time of thyroidectomy was suspected. Oppel advised the use of this operation only in those cases in which there was a definite hypocalcemia and a hyperexcitability of the motor nerves as shown by the tests of Wernon, Trousseau, and Bechterew, positive Erb and Chvostek signs are of minor importance in this respect. On the basis of these indications as outlined by Oppel, there were only 18 cases in the Leningrad series in which the indications for the operation were definitely positive, in 27 cases the indications were "relative," and in 62 cases "insufficient", while in 6 cases, as noted, the operation was done as a prophylactic measure.

Of the 113 cases in which operation was performed, only 42 have been followed up from two to eleven years after operation, in all but 6 cases, at least five years have elapsed since operation. Of these 42 cases, 11 were in the group in which there were definite indications for operation, 10 in the group with "relative" indications, 18 in the group with "insufficient" indications, and 3 in the "prophylactic" group. Excluding the latter group of cases, in which no symptoms had developed at the time of the operation, the results as determined by the follow-up study were as follows:

Of the 11 patients in the first group, 9 were cured, 1 was benefited, and 1 presented a doubtful result. Of the 10 patients in the second group, 4 were cured, 3 were benefited, and 3 presented a doubtful result. Of the 18 cases in the third group, none was cured or definitely benefited, 13 were not benefited, and 5 presented a doubtful result. In cases in which operation was performed only on relative indications, the results depended to a great extent upon whether there was sufficient functioning parathyroid tissue for the effective utilization of the bone graft, and upon the time of the survival of the graft.

From his study of these results, the author concludes that the bone graft by Oppel's method is indicated in the treatment of spasmophilia and tetany in adults only when there is a definite hypocalcemia (the blood calcium below 9 per cent) and when the Wernon, Trousseau, and Bechterew signs are positive. Cases of spasmophilia and tetany of moderate severity showing these typical signs are usually cured by this procedure. Severe cases of tetany associated with loss or marked deficiency of parathyroid function are not cured.

ALICE M MEYERS

Firor, W M, and Lamont, A The Apparent Alteration of Tetanus Toxin Within the Spinal Cord of Dogs *Ann Surg*, 1938, 108 941

The disease tetanus may be associated with two types of muscle spasm (1) rigidity, due to the action of the toxin on the voluntary muscles, and (2) clonic spasm, due to the action of the toxin on the anterior horn cells of the spinal cord. In experiments on dogs, it has been shown that these two phenomena may be dissociated. Multiple injections of the toxin into a hind limb of a dog may result in a continuous spasm of the leg muscles for as long as three months (Abel). Injections of minute amounts of toxin into an anterior horn of a dog's spinal cord results in the development of pure reflex motor tetanus (clonic spasms) without the development of rigidity.

During the course of experiments it was noted that every dog receiving an intraspinal injection of tetanus toxin died, although the quantity employed was but a fraction of the lethal dose given by any other route. For a better understanding of the cause of death in these cases a series of experiments was undertaken. By use of a special device minute quantities of tetanus toxin could be injected and measured accurately. It was found that elimination of clonic spasm by severance of the cord and roots before the intraspinal injection of minute doses of toxin does not prevent death, also, that the injection of as little as 1/20 of the calculated lethal dose injected into the white matter of the cord resulted in death of the animal. The intraspinal injection of 1/400 or more of the usual intravenous lethal dose of tetanus toxin has always been followed by the death of the animal, despite the fact that the toxin was placed in a non-vital center such as the lumbar cord.

The explanation that death results from an upward passage of the toxin is untenable because transection of the cord above the site of injection does not prevent death. Division of all sensory and motor pathways below the lesion is also without effect. The death of the animal cannot be caused by a multiplication of the tetanus molecule and subsequent reabsorption because the presence in the circulating blood of too neutralizing doses of antitoxin does not prevent a fatal outcome. In several experiments

fractions of lethal doses were placed in the sciatic nerve an anterior and posterior nerve root the adrenal gland and the brain without noticeable effect. The tentative explanation put forward to account for the results obtained in the foregoing experiments is that tetanus toxin is altered in the spinal cord to form a secondary substance which is responsible for the death of the dog.

MANUEL E. LICHTENSTEIN M.D.

Lockwood J. S. Observations on the Mode of Action of Sulfanilamide and Its Application to Surgical Infections. *Ann Surg* 1933 108 801

The author has conducted experiments designed to show the population curves resulting from the implantation of young encapsulated hemolytic streptococci into human serum and whole blood containing sulfanilamide. It is shown that normal human serum containing sulfanilamide (10 mgm per 100 c cm) is an unfavorable medium for the growth of small inocula of hemolytic streptococci. After limited primary outgrowth sterilization of the medium takes place within from twenty-four to forty-eight hours. If the organisms are added to the sulfanilamide serum after being washed free of peptone present in the culture medium this bacteriostatic and bactericidal effect is almost as active in the absence of leucocytes as it is in the whole blood containing leucocytes as well as sulfanilamide. The author believes that this demonstration of sulfanilamide action *in vitro* as a humoral mechanism tends to rule out the mechanism of phagocytosis as a major essential participant in the bactericidal effect caused by the drug.

Since the presence of traces of peptone in serum markedly lessens the growth-restraining influence of sulfanilamide it is inferred that sulfanilamide may act on hemolytic streptococci by interference with their protein-digesting mechanism. If peptone is present in the medium the organisms utilize it as a source of nitrogen in their growth metabolism and are not dependent on the utilization of complex serum proteins.

This conception of sulfanilamide action is consistent with conclusions drawn from a study of the effects of the drug on the course of hemolytic streptococcal infection in patients. The drug is most effective in diffuse invasive infections in which inflammatory tissue breakdown has not yet developed. The breakdown of tissue as in abscess formation creates in the body a medium for streptococcal multiplication in which sulfanilamide action is resisted. This may be due to the local liberation *in vivo* of products from protein splitting which have an inhibitory influence on sulfanilamide action similar to that of peptone in serum *in vitro*. In the clinical management of hemolytic streptococcal infections the surgical drainage of localized areas of suppuration is essential for supplementation of sulfanilamide therapy. Sulfanilamide tends to protect normal tissues against the further invasion by hemolytic streptococci.

Long P. H. and Bliss E. A. Toxic Manifestations of Sulfanilamide. *Ann Surg* 1933 108 808

The authors discuss the toxic manifestations of sulfanilamide therapy which were noted during the course of treatment of 335 patients at the Johns Hopkins Hospital Baltimore Maryland. Mild cerebral toxic effects consisting of dizziness headache psychic disturbances nausea and vomiting were common but rarely severe enough to warrant the cessation of therapy. They were particularly troublesome in ambulatory patients. Cyanosis occurred almost constantly but was not serious and was not a contraindication to further treatment. Clinical acidosis occurred in 3 per cent of the cases but could be prevented by the administration of sodium lactate or bicarbonate. Drug fever was found in 6 per cent of the cases but almost never occurred until after the fever of acute infection had disappeared. Some patients who had had drug fever reacted to subsequent resumption of the sulfanilamide therapy by reappearance of the fever but this did not always happen. Hemolytic anemias of mild degree were quite common and did not contraindicate therapy. In 3 per cent of the cases acute severe hemolytic anemia developed. These are among the most severe toxic reactions encountered and call for cessation of the therapy and resort to transfusions. Agranulocytosis was seen only once.

Careful observation of patients receiving the drug will permit recognition of the toxic effects before they have become serious and cessation of the therapy and the forcing of fluids is an effective treatment of most of them.

JOHN S. LOCKWOOD M.D.

Best C. H. Heparin and Thrombosis. *Brit M J* 1933 2 977

Though it was known that certain mammalian tissues contain one or more anticoagulants an active fraction was first isolated in 1916 and named heparin.

Under certain conditions heparin acts as an antithrombolytic but in other more physiological circumstances it is apparently an antithrombotic. The action of a very potent thrombolytic added to plasma can be inhibited by heparin. It can be titrated against thrombokinase with considerable accuracy under appropriate conditions so that thrombokinase may be termed an antiheparin or conversely heparin an antikinase.

Recently success in the purification of heparin was attained a process for the preparation of adequate amounts of satisfactory material from ox lung was evolved and a crystalline barium salt of uniform potency was obtained.

If a single dose of heparin is given intravenously the clotting time becomes prolonged. The increase in the clotting time depends on the size of the dose. There is no negative phase that is the clotting time does not go below normal after a massive dose of heparin it comes back fairly accurately to the initial value. Heparin can be given subcutaneously as well as intravenously as purified heparin is absorbed

quite rapidly from the tissue spaces, and a good effect can be obtained as a result of subcutaneous administration

When heparin is precipitated with protamine a very insoluble compound is formed which cannot readily be suspended. With benzidine, however, a compound can be prepared which is absorbed quite slowly and gives a clotting time of from ten to fifteen minutes for quite long periods. It is advisable to have a little unmodified heparin in the mixture, as certain doses of benzidine-heparin given alone will have no effect at all, but if they are given with the unmodified heparin the immediate and the prolonged action are both forthcoming.

The best procedure in the administration of heparin is to give a small dose intravenously and to follow this with a constant intravenous injection. The clotting time can be set at any chosen level and maintained for long periods. In experimental animals, 40 units per kgm. are given as the initial dose, which is followed with a continuous injection of 30 units per kgm. an hour. With this dosage the clotting time is usually maintained at from twenty to thirty minutes.

In a series of experiments, the effect of heparin upon the mixed thrombus produced when the internal surface of the veins was injured was determined. The injury was produced in the first series of experiments by mechanical means, such as clamping of the vessel repeatedly with strong forceps. In the second series, chemical means were used. After both these procedures a thrombus normally formed in a large percentage of the cases. Heparin was administered continuously to unanesthetized dogs for seventy-two hours after the injury had been produced, and healing of the surface of the veins was found to take place in this time with no tendency for thrombi to occur subsequently.

The white thrombus is the nucleus from which the mixed thrombus grows. In certain conditions, a thrombus was obtained which consisted entirely of platelets, and an attempt was made to determine the effect of heparin on this process experimentally. There is no doubt that in the case of the monkeys, dogs, and cats the action of heparin was to prevent the formation of the white thrombi.

In animals, heparin prevents the formation of thrombosis in the coronary artery in the same way as it does in the peripheral veins.

Evidence in favor of the view that heparin plays a physiological part is obtainable from a study of its distribution. The work of Howell and others has shown its presence in various tissues, including the blood. Its presence in particularly large amounts in the mast cells of Ehrlich has been demonstrated, and the possibility that these cells are responsible for its production has been suggested. There is evidence also that the increased clotting time seen in anaphylactic and peptone shock in the dog is due to the liberation of heparin.

It has been known for some time that while histamine may account for many of the signs of ana-

phylaxis, it has little or no effect upon the coagulability of the blood. When a dog goes into anaphylactic shock there is a very great rise in the clotting time, from four to five minutes to perhaps forty-eight hours. Samples of the blood can be taken and the heparin equivalent estimated. The results show that heparin in a concentration of approximately 15 units per c. cm. appears in the blood of the animal in anaphylactic or peptone shock. This amount of heparin is sufficient to raise the clotting time of the blood from the normal value to such extremely high levels (from sixty to seventy hours) that it may be termed incoagulable. When an animal is shocked after hepatectomy, little or no rise in the clotting time of the blood or in the heparin is found. Furthermore, from the blood of the shocked animal much more heparin is obtained than can be detected in the blood of the normal animal, while the liver of the shocked animal contains less heparin than the normal liver. The physiological and chemical results provide practically conclusive evidence that the anticoagulant isolated from the blood of the shocked animal is heparin, and it may be possible to prepare this material as the crystalline barium salt. It appears, therefore, that in anaphylactic shock in dogs, histamine, heparin, and possibly other substances are liberated.

Clinically, it was found that none of the preparations available, except that which had been through the stage of the crystalline barium salt, could be given with complete safety. The fact that this highly purified material can be safely given to human subjects over long periods is well established by the findings in some 350 patients, most of whom had experienced a major operation before heparinization was started. The intravenous administration of heparin is never begun earlier than two or three hours after the completion of a major operation, a splenectomy, for example, and is continued until the patient is able to move actively about in bed. This may be for three or four days, or it may extend to two weeks.

It is hopeless to attempt to secure information regarding the effect of heparin in the prevention of thrombus formation by the indiscriminate heparinization of postoperative cases or by the heparinization of isolated cases. Those cases should be selected for study in which hospital statistics show that the incidence of postoperative embolism is relatively high. The best type of case for study would probably be that exhibiting the rather rare condition known as phlebitis migrans. If it were possible to collect a group of these cases in one ward and thoroughly study them before and after the administration of heparin a great deal might be learned.

If the clinical cardiologist knew when thrombosis was about to occur, he might, by the appropriate use of heparin, secure a short reprieve, perhaps even a long one, for some of his patients. Heparin is readily available, and can apparently be given safely to hospitalized patients, but our lack of knowledge, or perhaps the complete absence of premonitory signs, makes it impossible to conduct a clinical investiga-

tion along these lines. Heparin might be given immediately after an attack of coronary thrombosis, but clinicians do not agree when discussing the spread of thrombosis from the original focus or the significance of intramural thrombi formed as a result of coronary thrombosis. If a clinical investigation of cardiac cases should be initiated, the necessity for studying very large numbers and for heparinizing only alternate cases is obvious.

One of the best methods of determining the clinical rôle of such a substance as heparin is to push ahead with more studies along physiological and experimental pathological lines in the hope that the clinical applications will become apparent.

SAMUEL KARN, M.D.

Imperati L. So Called Allergy Due to Catgut. Experimental and Clinical Contribution (Sulla cosiddetta allergia da catgut. Contributo sperimentale e clinico). *Riv di chir.* 1938 4 477.

In order to answer the question regarding the so-called sensitivity to catgut which seems to have received a certain amount of support from the clinical observations and the experimental studies of various authors Imperati has made various investigations. He studied from the clinical and experimental points of view the reactions caused by catgut in animals sensitized with catgut and various serums. He studied the phenomenon of Sanarelli-Schwartzmann resulting from the use of catgut, the behavior of laparotomy sutures in animals previously sensitized with catgut or catgut extract and the results of intradermal reactions to catgut extract in 30 normal patients and in 30 patients offering some anamnestic antecedent such as an injection of serum anaphylactoid disease or surgical intervention with catgut suture.

The first group of animal experiments was made with iodized catgut No. 3 or 4 on normal rabbits and guinea pigs and on animals sensitized with sheep or horse serum. A small piece of catgut was introduced subcutaneously or into the peritoneal cavity on one side and a piece of silk suture on the other side and the animals were sacrificed from

fifteen to twenty days later to verify the result of the experiment. While no local change was observed in normal animals a rapid and intense reaction to catgut and a lesser reaction to silk were found in animal sensitized with serum especially in those in which the material had been introduced into the abdominal cavity.

In the second group of experiments on rabbits in which the intradermic injection of catgut extract was followed twenty-four hours later by an intravenous injection of the extract or of an active filtrate of bouillon culture of bacillus coli and vice versa for the latter the result were regularly negative.

In the third group of experiments in which 30 guinea pigs were subjected to a short catgut suture of the subcutaneous tissues of the back 5 animals were given an intraperitoneal injection of catgut extract every ten days and all the animals were submitted later to laparotomy and subsequent catgut suture of the abdominal wall. Practically no difference was found in the healing processes of the laparotomy wound in any of the animals and in the course of healing there was no anomaly of allergic nature culminating eventually in total laparotomy dehiscence as claimed by Kraissl and his coworkers.

Among the 30 normal patients the results of the intradermal reaction to catgut extract were negative in 24, doubtful in 3 and positive in 3; among the 30 patients with operative or allergic antecedents the results were negative in 17, doubtful in 6 and positive in 7. The fact that a positive intradermal reaction may be obtained in subjects who do not offer any anamnestic antecedent may depend on the unknown presence of sensitizing causes of minor degree. On the basis of his results the author rejects the existence of anaphylaxis due to catgut but admits that under special conditions of organic sensitization especially of a constitutional nature catgut more than any other type of material though not exclusively may be capable of causing quite marked local reactions.

RICHARD KEMEL, M.D.

INTERNATIONAL ABSTRACT OF SURGERY

JUNE, 1939

PRINCIPLES OF SURGICAL PRACTICE

ROUND TABLE CONFERENCE

THE TREATMENT OF OPEN WOUNDS

ROY D. McCCLURE, M.D., F.A.C.S., Detroit, Michigan

FUNDAMENTALLY, the treatment of any open wound consists of aiding Nature to repair the defect, in the shortest time, with a minimum of cutaneous and subcutaneous scarring. Our efforts to help, therefore, should be directed toward instituting only those measures which will accomplish a definite beneficial end but will interfere least with the local reparative processes. This obviously bespeaks a thorough conception of what is known of the processes of repair and of regeneration in the various tissues of the body.

The term "open wound" in its broadest sense implies the inclusion of all examples of dissolution of tissue continuity, ranging from a trivial traumatic wound to the large wounds of deliberate surgical procedure.

Largely because of disruption of the normal elastic tension of the integuments and other factors dependent on size and shape, the problem most difficult for Nature to cope with, in all but the smallest wounds, is that of primary closure. Conversely, it is this difficulty that is most easily remedied by the mechanical aids of suture or bandage. Divergent views are held on the propriety of early closure in many surgical and in most traumatic wounds. We believe that if the character of the wound warrants it, early accurate apposition of its surfaces will fulfill most completely the terms of our original definition.

I have spoken of the character of a wound as the conditioning factor of early closure, but we are so accustomed to think carelessly of the character of wounds as "clean" or "dirty" that several notes of warning should be sounded. One is that the "cleanliness" of a wound is only relative, and that some contamination is always present. Another is that the physical characteristics of the wound surfaces with regard to such matters as the presence of infiltrative hemorrhage, crushed tissue in the smallest amount, or tissue devitalized by occlusion of its blood supply are too frequently overlooked and disregarded. The third is that there is a tendency to overlook the fitness of the patient to carry on all the physiological processes necessary for prompt healing. It was the acute sense of, and constant regard for, the delicacy of all tissues and their extraordinary powers of repair under suitable conditions, that in their own times marked Paré, Lister, and Halsted out from among their surgical contemporaries and made them not only great but the greatest of surgical masters. It is only by the constant practice in detail of treatment based on such fundamental concepts that any of us have the right to call ourselves their disciples. It is of these physiological factors and of the possibilities of successful early closure of accidental wounds that my colleagues, Drs. Howes and Ferguson, are going to speak to you in a few minutes.

As you well know, the conditions present in many wounds at their inception are often far from

ideal so that when we first see them immediate closure is out of the question. In the treatment of wounds of this type whole categories of agents confront us physical agents such as heat sun light and ultraviolet or roentgen rays chemicals such as solutions or ointments with germicidal and bacteriostatic properties or alleged powers of stimulating epithelial growth and of inhibiting granulation tissue, and finally remedies which may be loosely termed physiological such as saline solution maggot extract insulin vitamins rest posture and passive motion. From these we may choose and our choice will be wise if it is based on concepts of simplicity directness of action specific applicability to the wound in question and above all furtherance and not inhibition of natural physiological processes. To illustrate the foregoing statement I would like to mention certain investigations carried on in our hospital by Frank W. Hartman. This work began two or three years ago in connection with efforts to add an effective antiseptic agent to tannic acid in the Davidson treatment of burns. Having used truersol in the preparation of bacterial vaccines and being impressed with its effectiveness as well as its seemingly limited destruction of tissue when injected subcutaneously he synthesized and tested various other higher cresols fixing finally on two preparations hexochloro-m cresol and dichlorohexylre orcinol. Being used according to the method of Salle and Lazarus these two compounds were compared with other commonly used antiseptics with the following results hexochloro-m cresol 0.019 tincture of iodine 0.03 dichlorohexylre orcinol 0.08 merthiolate 26.0 mercurochrome 35.0 and metaphen 44.0. These figures show how comparatively non-injurious the higher cresol and resorcinol compounds are for tissue cells yet they retain an active antiseptic value in dilutions from 1 to 1000 to 1 to 3000. It is about the care of the more complicated open wounds

that my colleague Dr. Reid will speak and about which I myself may have some things to say later on in the discussion.

Time knowledge experiment and experience have largely eliminated the use of substances really detrimental to the healing of open wounds. Yet in employing various of the more rational harmless yet helpful products in current use one wonders if most of us do not overlook the inherent powers of the human body and fall too easily into stereotyped and empirical use of these agents without weighing the real necessity for their use. A final item in the treatment of wounds is the dressing itself. The type of dressing their support their frequency, and above all the technique of their practice are important and are subject to great variations and I hope this phase of the subject will receive due attention during our session.

A type of wound in which proper treatment is of the greatest importance is the severe burn. Since E. C. Davidson late resident surgeon at our hospital worked out the tannic acid treatment of burns which bears his name we have always had the greatest personal interest in this subject. Davidson pointed out in his original contribution the equal importance of the prevention or treatment of shock and the need for absolute asepsis. We still believe that the tannic acid treatment is most satisfactory if surgical principles are observed and that aseptic methods are always of much more importance than antiseptic solutions. These two great principles fundamental in all types of wounds should be observed in the treatment of burns. Therefore if the physician or surgeon would simply regard a burn as a surgical wound to be kept surgically clean much of the problem of healing would be solved.

In the above paragraphs I have tried to indicate what seem to me the basic problems in the treatment of wounds and to sketch the framework of what I hope will be a profitable discussion.

THE TREATMENT OF OPEN TRAUMATIC WOUNDS

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THE problem in the treatment of the open traumatic wound is one of conversion of a lacerated and contused potentially infected wound into one which is surgically fresh and clean. If this can be accomplished primary healing may be expected.

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In the treatment of such wounds it should be remembered that bacterial invasion of the tissues probably does not take place for six hours. There should be hardly a wound then that could not receive adequate treatment while the bacteria are still on its surface. It should also be recalled to mind that healthy living cells have a remarkable power to combat bacteria. The problem then re-

solves itself into removal of dead and devitalized tissue and protection of viable tissue from damage

Before mechanically cleansing the wound, it is necessary to prepare the surrounding skin tissue. The wound is protected with sterile gauze and the surrounding skin liberally washed with soap and water. If there is much grease, benzine or ether may be used in addition, but the liberal use of soap and vigorous scrubbing gives the best preparation of the surrounding skin tissues. After the skin has been dried with sterile gauze, some form of skin antiseptic may be applied if desired. Unless the wound is very extensive, the remaining portion of the mechanical cleansing may be carried out under local anesthesia. The anesthetic solution is introduced from the surrounding uninjured skin so as to build a wall of anesthetic to surround the traumatic wound. One-half or one per cent of procaine hydrochloride gives excellent anesthesia.

Removal of dead and devitalized tissue should be accomplished by sharp excision. In so doing, the surgeon should remember that the tissues having the poorest blood supply, the fascia, tendons, and fat, are those which are most easily damaged by trauma and have the poorest natural resistance to infection. These tissues should be excised if there is the slightest doubt as to their viability. Muscle, and especially skin, may be treated with more conservatism.

Under the head of protection of viable tissue from damage should be listed the principles of the handling of any surgical wound. Care and gentleness are of paramount importance. The avoidance of crushing instruments and the prevention of trauma by retraction are well known but frequently neglected principles. Sharp retraction with sharp rakes, towel clips, or tension sutures may be recommended to avoid wound trauma.

The control of bleeding must be carried out with the thought of preventing tissue injury constantly in mind. As a rule, it may be delayed until the wound is ready for closure, by which time many of the smaller vessels may have closed. In the application of hemostats, only the bleeding point should be caught in order that the smallest possible stump of devitalized tissue is left beyond the ligature. The vessels just beneath the skin rarely need ligation and many bleeding points may be controlled by hemostat crush without ligation. In wounds of the extremities, especially those below the elbow and knee, a blood-pressure cuff used as a tourniquet will permit careful, rapid work without the necessity of sponging.

Foreign bodies, and blood clots which act as foreign bodies, should be removed because they

harbor and encourage bacterial growth and prevent normal wound healing. These are best removed mechanically, by flushing the wound with generous quantities of warm physiological saline solution. The use of antiseptic solutions, if not definitely harmful, certainly contributes nothing to the healing of the wound. If a wound heals well when antiseptics have been used, it heals in spite of the antiseptics rather than because of them.

The wound should be closed so as to avoid dead space, where blood clots and serum collections may encourage bacterial growth and delay the normal processes of wound repair. Dead space may be partly obliterated by the use of a few judiciously placed, buried sutures, with a snug dressing for additional obliterating pressure. The suture and ligature materials should be chosen and placed with a view toward minimizing injury to the wound tissues. Catgut has been shown by numerous investigations (Babcock (1 and 2), Howes and Harvey (3), Whipple (4)) to act "not only as a foreign body but a foreign body which induces exudation reaction, and therefore delays healing" (3). If it is to be used at all, it should be used in very small sizes, 00 and 000, and cut exactly at the knot. It is much better to use material which produces little or no reaction in the tissues, and in this respect fine silk or fine alloy steel wire are excellent. In our experience the steel wire has been by far the best material. It is fine and easily tied, and even when buried in the tissues, it apparently causes no foreign-body or other untoward reaction. In suturing the wound, the sutures should not be tied so tight as to crush the tissues. The skin sutures should be interrupted and tied just tight enough to approximate the wound edges, as subsequent edema may increase the tension at the suture for the first few postoperative days.

It is desirable to obtain a skin covering in an open wound as early as possible and, if a thorough mechanical cleansing has been accomplished, a primary split-thickness skin graft may be applied where there has been a loss of surface covering. Or it may be possible to close a wound by the use of relaxing incisions. In any event, an effort should be made whenever possible to convert an open wound into a closed one at the earliest possible moment, preferably at the first operation. Drainage is not employed unless there is oozing which has not been controlled by ligature. When the trauma has involved the deeper muscle tissues or bone, a considerable and rapid swelling and tension in the part may be expected. In such cases long relaxing incisions must be made

throughout the entire length of the part involved on one or both sides

The dressing should be applied so as to give elastic pressure to the area of the wound. The pressure of moist sea sponges is ideal but fluff gauze snugly bandaged in place will serve very well. On the extremities it is wise to insure physiological rest by appropriate splinting. The part should be elevated for the first four or five post operative days. This is the best prophylaxis against the development of an edema which reduces the effective capillary flow, produces pain and delays healing. Dressings should not be changed until the sutures are to be removed unless local signs and symptoms indicate an infective inflammatory reaction. If desired the outer dressings may be changed as they become soiled but the dressing next to the wound should be

allowed to remain in place. The dried blood and serum adherent to the wound form the most effective moulded splint that could be provided.

It is probable that fibroplasia and eventual healing is somewhat more delayed in the traumatic wound than in the usual surgical wound. It is therefore frequently wise to leave the wound untouched and the sutures in place for from ten to fourteen days or even longer. In some cases of compound fracture I have left steel wire sutures in place for three months without any reaction about the sutures.

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THE RELATIONSHIP OF THE GENERAL CONDITION OF THE PATIENT TO THE HEALING OF THE OPEN WOUND

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THE open wound heals in two definite phases. During the first or lag phase the size of the defect does not change; the vascular reaction occurs; exudation and phagocytosis take place; lysis of necrotic material goes on and foreign bodies are extruded. This period lasts four or five days in healing *per primum* and is proportionately prolonged by excessive amounts of necrotic tissue, by the presence of foreign bodies and by infection. In the second phase the defect rapidly diminishes in size. Contraction of the surrounding uninjured tissue accounts for the greater portion of the reduction in size and the processes of fibroplasia and epithelialization complete the closure. The second phase begins only when the first is finished. In healing *per primum* the second phase starts at approximately the same time throughout the length and breadth of the wound, whereas in untoward healing there is considerable variation in the initiation of the second phase in different portions of the wound. With infection the second phase proceeds irregularly or might even cease to progress.

In other words, the local condition in the wound determines the duration and character of the phases, but occasionally the general condition of the patient becomes the dominant influencing fac-

tor. These changes in the general condition of the patient which influence wound healing are related to the state of nutrition, the circulation, disease elsewhere, and resistance to bacterial invasion.

The age of the patient has a direct influence on the length of the lag period. It is shorter in the very young and tends to lengthen with age. The index of cicatrization increases with age, while the rate of fibroplasia is less retarded in the young.

Because the regeneration of tissue during healing is really a growth phenomenon, diet affects the character of the second phase. A diet rich in casein stimulates the rate of fibroplasia, while a diet rich in fat retards it. No definite proof can be offered, however, that changes in the carbohydrate metabolism influence the character of the second phase of the healing, except as the indirect result of disturbing the first phase. Clinically, diabetes predisposes to infection and prolongs the first period, while correction of the hyperglycemia by the use of insulin quickly turns the balance and healing takes place. There is no conclusive evidence that insulin used locally or in the absence of diabetes stimulates repair. Dehydration markedly retards the entire healing process. Clinically, the poor healing of wounds in dehydrated children with pyloric stenosis is well known. Experimentally, the rate of fibroplasia is slowed up in animals not receiving an adequate intake of water.

Recently it has been shown that C-avitaminosis markedly changes the character of fibroplasia. Fibroblasts appear as well as the reticular network, but the collagenous fibers do not mature properly. Consequently, incised wounds do not gain their expected strength and are apt to disrupt and produce an open wound. Prevention of disruption, of course, prevents the occurrence of an open wound, and, as subclinical scurvy is apparently more prevalent than generally supposed, especially in patients with cancer, the suggestion has been made that a deficiency of Vitamin C should be sought by chemical means and, if present, corrected by the administration of ascorbic acid. No didactic statements can be made on the influence of the other vitamin deficiencies on wound healing because in spite of an abundance of investigations, the interrelationship of these deficiencies to the general metabolism is so complex that interpretations are difficult. The problem of Vitamin-A deficiency may be briefly mentioned however. Normal epithelium undergoes distinct changes in morphology when there is a deficiency of this vitamin, and the healing of open wounds is said to be benefited by an adequate intake of Vitamin A. For this reason, cod-liver oil has been applied locally to open wounds, but recent work tends to show that some other property of the oil other than its vitamin content is responsible for the hastening of the repair. Other workers question whether cod-liver oil stimulates wound healing at all. Clinical observations on the stimulating properties of local applications are apt to be enthusiastic.

The beneficial effect of an adequate circulation in stimulating healing and, conversely, the detrimental influence of local or general anemia are too well known to require more than a mention. The effect of increasing the temperature of the body in general or of the part involved is related to the question of the efficiency of the circulation. The rate of cicatrization of open wounds is speeded up experimentally by increasing the body temperature, and the rate of fibroplasia is improved by increasing body heat. The cradle and light have been used clinically for some time to stimulate the healing of open wounds, particularly on extremities with poor circulation.

Syphilis and tuberculosis are general diseases which are frequently accused of delaying the healing of the wound. There is no definite proof, however, that they do so, unless they are actually present in the wound. On the other hand, purulent infection elsewhere delays wound healing ex-

perimentally, but, so often clinically, when the adverse effect of disease elsewhere is considered, the question must always be asked whether the disease itself or some secondary change in the metabolism incident to the disease is the cause. Poor healing, for example, is notorious in patients with lymphogranuloma inguinale, yet when the anemia is corrected by transfusions, and an adequate intake of protein and vitamins is provided, the wounds heal promptly although the disease is still present.

With the recent reintroduction of general chemotherapy in the treatment of established streptococcal infection, it was but natural that sulfanilamide should be used to prevent infection by this micro-organism and by the bacillus welchii. These are the two most feared. We have given prophylactic doses of sulfanilamide in the early treatment of open wounds and have believed that in several cases beneficial effects were obtained. In these cases the toilet of badly traumatized wounds could not be adequately carried out, or the patients presented themselves too late after injury for débridement to be performed. It must be emphasized, however, that under no circumstances must the toilet of the wound be neglected. The combination of foreign body or dead tissue plus bacteria is a powerful one for producing infection and can hardly be defeated by the use of a drug alone. It is better to remove the foreign body and the dead tissue. Too often, the local toilet of the open wound is neglected simply because the wound is going to be left open.

Lastly, the question arises whether any change in the general condition of the patient, a change in nutrition, circulation, or chemotherapy, would produce an unusually rapid rate of healing. Such an advantage is seldom required. Most patients presenting themselves with open wounds, which are usually traumatic, have an adequate circulation and a balanced metabolism. On the other hand, in the small group of cases in which the general factors might delay healing the condition is easily recognized: diabetes, dehydration, malnutrition, or nephritis. If wounds become chronic or fail to heal, the general condition of the patient must be considered, of course, but in the majority of instances, there is more likely to be a local fault, a symbiotic or unusual bacterial flora, a sclerotic base, sloughing fascia, exposed bone, or infection in the bone. When these faults are corrected by the surgeon, it is generally found that the healing rate of the tissues is all that may be desired.

COMPLICATED WOUNDS

MONT R. REID, M.D., F.A.C.S., Cincinnati, Ohio

COMPLICATED wounds which by reason of their nature or the condition of the patient cannot be closed do not to my mind alter any of our fundamental principles of the treatment of wounds. In such case one paramount principle is that the life of the patient must always be considered. In the handling of these more serious wounds an easy mistake is to treat the wound at the expense of a life. It is often better to apply a sterile dressing and a splint and do nothing more to the wound until the patient's general condition can be improved to the point where the risk of treating the wound may be materially lessened. This may even delay the treatment of the wound beyond six hours or into the period when wounds must be regarded as infected and not just soiled. This evaluation of what a patient can stand in the presence of a severe wound is difficult. The pulse may often belie the true condition of the patient who may not be able to stand much manipulation. This is true particularly when there has been great loss of blood or compound injury of the bones and joints. The establishment of blood banks with a ready supply of blood will undoubtedly save many lives in cases in which mistakes in judgment are made as to how much the patient can stand. The apparently good risk can go into shock astonishingly fast and it is my belief that in the case of all severe and complicated wounds a supply of proper blood should be on hand before operative procedures are begun.

With these reservations let us assume for purposes of discussion today that the ideal therapy may be employed in the cases of soiled severe wounds which cannot be treated by the ideal therapy of cleansing and primary closure as outlined by other discussants. In such cases I believe there is no greater justification for the most careful cleansing of the wound such as the removal of all foreign bodies, the elimination of blood clots and dead and devitalized tissues, and the careful washing of the wound with salt solution and with neutral soap and water if necessary to clean any greasy and dirt stained living tissues. Dirty bits of bone and cartilage which cannot be cleaned may be removed by a sharp chisel or knife. I believe it well nigh criminal to reason that because such a wound is going to be left open it can be packed with

gauze with very little attention to the toilet of the wound. After all it is going to be denied the normal protection of skin and mucous membrane and until its next best protection granulation tissue forms it will readily disseminate bacteria and toxic substances through its open lymphatic and vascular capillaries. In this connection I am assuming that primary grafting which should always be done whenever possible and which demands the most meticulous cleansing of the wound can not be done for some reason.

After the thorough cleansing of a complicated wound which cannot be closed or grafted the next problem is to secure for that wound the protection of granulation tissue as soon as possible. One sure way to handicap the formation of granulation tissue is by frequent dressing with gauze packing which steals away the very food which granulation tissue must have for its growth and besides constantly opens up new channels for the spread of infection. Muscular and joint action and mechanical manipulation of such a wound do almost as much damage to this food and in addition cause hemorrhage and damage to the living cells and open up channels for the spread of infection.

Thus my feeling about such wounds is that after the most careful primary toilet of them they should be disturbed even less than wounds treated by primary closure that they should be absolutely fixed and that the substance which comes in contact with such a wound should not absorb it or in any way steal away the food needed for the growth of granulation tissue. For this substance I prefer vaseline or paraffine when its use is possible or vaseline soaked gauze when necessary for the oozing of blood from points which do not justify the necrosis of ligatures.

The practical application of this philosophy is illustrated by the following case: a young girl of fourteen years receded in an automobile accident an extensive laceration and contusion of the left thigh. A large triangular flap of skin and muscle was turned upward from just above the knee. The wound extended from the mesial side of the thigh across the top to the lateral aspect where it met a vertical laceration which extended upward for more than 6 inches. The muscles were torn and lacerated up as far as the greater trochanter and exposed the bone from which a considerable area of periosteum had been removed. The tissues were badly stained and there were many streaks of

varying sizes throughout the extent of the wound. After a painstaking irrigation, débridement, washing with soap and water and again with salt solution, requiring more than an hour, the triangular flap of skin and subcutaneous tissue were gently laid back and sutured with 3 sutures which failed by $1\frac{1}{2}$ in to approximate the skin edges. No buried sutures were placed in the wound. A large vaseline dressing was applied and the leg was encased in a large plaster spica which included the abdomen and foot. Although this patient was unconscious from a concussion of the brain and incontinent for three days, during which the dressings became soaked with urine, another dressing was not made for ten days. Healing was by first intention except for the gaping, where there was healthy granulation tissue.

This patient was given gas-bacillus antitoxin in addition to tetanus antitoxin, a procedure we always follow in cases of severe and complicated wounds.

The protection of granulation tissue is another problem which I have discussed in my published papers, but for which there is not time today. Suffice it to say that we prepare such granulating wounds for secondary closure or skin grafting by using the Carrel-Dakin solution, and that we alternate between its use to control infection and use of tissue-growing procedures, when we depend upon epithelization from the edges for healing.

In connection with this subject do not forget what Billroth said nearly seventy-five years ago: "If you inject a drachm of putrid fluid into the subcutaneous cellular tissues of a dog, the result will be inflammation, fever and septicemia. If you make a large granulating surface on a dog, and dress it daily with charpie soaked in putrid fluid, it will have no decided effect. On the borders of the inflammatory new formation the lymphatic vessels are closed, on the granulating surface there are no open lymphatic vessels, hence no reabsorption takes place."

QUESTIONS AND ANSWERS

Question What is the dosage of sulfanilamide?

DR HOWES Because of the dangers of untoward reactions from sulfanilamide, a small dose, 10 gr t.i.d., should be given during the first twenty-four hours. A full therapeutic dose is given during the next two days with a gradual reduction in the amount during the third and fourth days. On account of its hemolytic action sulfanilamide should not be given to patients who have anemia because of marked blood loss, unless transfusions are also given.

Question How does hypoproteinemia affect the healing of wounds?

DR HOWES While I have no absolute proof that hypoproteinemia affects wound healing, I would say that, because of the analogy between healing and the growth phenomena in general and because hypoproteinemia when extreme produces edema, healing would be retarded by hypoproteinemia. In acute starvation in adult rats no change in the rate of fibroplasia was found, but in young rats a definite retardation of the process was observed. It is doubtful, however, whether these animals had a true hypoproteinemia.

Question When should a primarily closed wound be dressed, and how often?

DR FERGUSON Dressings of primarily closed wounds should not be changed unless there is some reason for the change. The less the wound is disturbed by removal of the dressings, the more rapid the healing. The reasons for change of

dressings are (1) removal of sutures, (2) suspicion of inflammatory reaction (infection?) in the wound, and (3) insecure or soiled dressing. The removal of skin sutures should usually be the reason for the first dressing of the wound. The sutures may be removed from the fifth to the tenth day after wound closure. With silk or fine alloy steel wire, the sutures may be allowed to remain in place even longer without fear of reaction in the wound.

Inflammatory reaction in the wound due either to tissue edema following trauma or to infection is indicated by pain and swelling in the region of the wound. This usually appears on the fourth or fifth day after suture, and the wound should be inspected and appropriate treatment given. If the pain is due simply to tissue edema, elevation and the application of evaporating solutions, such as 70 per cent alcohol, have been found helpful. If there is definite evidence of infection, the sutures should be removed, the wound edges separated, and hot moist dressings applied.

Insecure or soiled dressings should be replaced with neat snug dressings. Usually the gauze next to the wound need not be disturbed, only the outside dressings and bandage being replaced. As a rule there is little necessity for changing the dressings on an uncomplicated primarily closing traumatic wound more often than every five days.

Question What should be done as first-aid treatment in open wounds?

DR FERGUSON As a rule the least done in the first aid treatment of open wounds the better. An attempt should be made to stop the bleeding by pressure or if necessary with a tourniquet. The wound should be protected from further contamination by a clean preferably sterile gauze dressing and bandage. Further tissue damage should be prevented by the use of a protective splint. With this type of first aid treatment the patient should be taken to a hospital or dispensary where appropriate and adequate primary treatment can be given to the wound.

Question What type of skin grafts should be used?

DR FERGUSON In the attempt to obtain primary closure of wounds in which there has been a loss of skin split thickness or full thickness skin grafts are the most useful.

Question What is the value of removing air from closed wounds to prevent hematomas?

DR REID I think it is extremely important to remove the air from a wound immediately after it is closed. This can usually be done by the insertion of a clamp between the sutures and the application of gentle but firm pressure over the entire area of the wound. This is of especial value in the case of thyroidectomy wounds. It is our feeling that air trapped in the wound predisposes to the collection of serum or the formation of hematomas which predispose to infection.

Question Is ether poured in a traumatic wound harmful to the cells?

DR REID It most certainly is. In the first place it is not likely to kill all the bacteria and besides it kills or damages many cells which then serve as excellent food for the bacteria left in the wound. The harm of ether and alcohol upon living cells can easily be proved by their effect upon the growth of living cells *in vitro* by making a fresh open wound on a dog and pouring ether or alcohol into such a wound one can note its effect on subsequent days.

Question When should a primarily closed open wound be dressed and how often?

DR REID The answer to this question naturally depends upon the seriousness of the damage beneath the closed wound. In the case of soft tissue wounds it is our policy not to dress them until it is time to remove some of the sutures unless the patient complains of pain or develops a fever which might make the surgeon suspect that the wound has become infected. In the case of wounds in which there is a serious subjacent injury such as a compound fracture or the opening of a joint it is our belief that the dressing should be delayed considerably longer and that the harm of leaving in a few silk skin sutures longer than necessary is more than outweighed by the value of rest and non interference to the more important injured structures beneath the closed skin.

FINAL REMARKS BY DR MCCLURE

It has been a source of great satisfaction to me to listen to the tributes paid to my teachers the late William Stewart Halsted and Alexis Carrel whom we are fortunate to have here with us. We are all familiar with the far reaching importance of Dr Carrel's work on wound healing especially his contributions to the management of war wounds. Dr Halsted as you all know did pioneer work in the handling of surgical wounds. I wish to add my personal tribute to these men because of my long association with both of them.

When one reads the monograph *The Aseptic Treatment of Wounds* published by Professor Schimmelbusch early in the 1890's one is filled with amazement at the miraculous saving of life and limb immediately after the realization of the then surgical leaders of the great value of asepsis. Some authorities believe that very little improvement has been made in the treatment of wounds since that time. However we know that much progress has been made in centers where the principles of asepsis have been strictly applied.

The question now arises as to whether further progress is possible. We believe as I stated in my opening remarks that antiseptics would not be so heartily condemned if search were directed toward the discovery of solutions which would be harsh to bacteria but kind to tissue cells. We know that such antiseptics are now being developed and investigated in various laboratories. Proof of their innocuousness is demonstrated by the fact that it is possible for them to be taken by mouth or to be injected intravenously without damage to the tissue cells. Further work must be directed along this line.

Another great advance is suggested in the treatment of gas bacillus infections. The creation of a high oxygen content in the blood and tissue cells by placing the patient in 100 per cent oxygen atmosphere offers great promise of advancing the treatment of this type of infection.

The thought I wish to leave is that we should not rest on our laurels or feel that further progress cannot be made.

DEEP INFECTIONS OF THE NECK

Collective Review

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INTELLIGENT treatment of deep infections of the neck is founded on not only a broad personal experience in the therapeutic management of these conditions but also a comprehensive knowledge of present-day observations, opinions, and conclusions concerning their nature. A review of the literature may be somewhat confusing since one encounters contradictory statements regarding the course of these infections, conflicting anatomical terms particularly in reference to the cervical fascial planes, and differences of opinion as to the proper surgical treatment. This situation necessarily exists because medical men have approached the problems which arise in the management of infectious processes in the neck from divergent points of view. Then too, so many variable factors influence the course of these infections that principles of treatment are not reducible to definite rules which can be adapted to every case. No doubt, many of our present deductions will be modified and clarified by further research and observation.

This paper consists of a collective review of articles which have appeared in the American and English literature in the past five years and which deal with infections of the neck. Statements made by ourselves are based on a paper entitled "Deep infections of the neck," (20) in which we have analyzed the histories of 267 patients who were treated at The Mayo Clinic for a deep cervical infection.

In general, an infectious process in the neck may exist as a superficial inflammatory lesion (furuncle, carbuncle, erysipelas), as a cervical adenitis, the involved glands of which may break down and undergo abscess formation, or as a cellulitis with or without suppuration. The various types of cervical infection are numerous, and to systematize their study Havens (15) has prepared the following classification: (1) acute suppurative conditions in the neck, (2) woody or ligneous phlegmons (which we consider as characterized by excessive inflammatory induration in which purulent material never develops or does so very

late in the disease), (3) infections of a specific nature, including tuberculosis, syphilis, actinomycosis, and tularemia, (4) infected cysts and tumors, such as cystic hygromas, lymphangiomas, and degenerated malignant lymph nodes, and (5) acute suppurative and non-suppurative thyroiditis. In this paper, we are concerned neither with superficial inflammatory lesions nor with specific forms of cervical infection.

ETIOLOGY

Numerous factors contribute to the development of a cervical abscess or cellulitis. Primarily, such infections consist of the invasion of tissue by pathogenic bacteria. The intensity of inflammatory reaction produced by the presence of these organisms is proportionate to their virulence and to the resistance of the involved tissues.

In the prevention or control of an acute suppurative condition, resistance is an important but inconstant factor. The vitality of the tissues and their inherent ability to withstand infection may be materially diminished in cases of chronic, toxic or destructive disease, as syphilis, nephritis, or diabetes. A great number of authors have reported the association of such diseases with infections, these and similar chronic diseases are significant factors, when present, they are also serious complications.

The sex and age of patients with infections of the neck are of little or no importance. Beck reported that in his 24 cases, approximately 59 per cent of the patients were females and 41 per cent were males. In our group (20) of 267 cases, 59 per cent of the patients were males and 41 per cent were females. As to age, 50 per cent of Beck's patients were infants and children, 50 per cent were adolescents and adults. Boemer said that of his 75 patients with suppurative conditions in the neck, 26 were adults while 49 were children. It is well to consider, however, that of 49 patients who were children 38 had retropharyngeal abscesses, which are particularly prone to occur among children. In our 267 cases, (20) 43 per cent of the patients were under, and 57 per cent were past, the age of twenty years. In these cases the youngest

DR FERGUSON As a rule the least done in the first aid treatment of open wounds the better. An attempt should be made to stop the bleeding by pressure or if necessary with a tourniquet. The wound should be protected from further contamination by a clean preferably sterile gauze, dressing and bandage. Further tissue damage should be prevented by the use of a protective splint. With this type of first aid treatment the patient should be taken to a hospital or dispensary where appropriate and adequate primary treatment can be given to the wound.

Question What type of skin grafts should be used?

DR FERGUSON In the attempt to obtain primary closure of wounds in which there has been a loss of skin split thickness or full thickness skin grafts are the most useful.

Question What is the value of removing air from closed wounds to prevent hematomas?

DR REID I think it is extremely important to remove the air from a wound immediately after it is closed. This can usually be done by the insertion of a clamp between the sutures and the application of gentle but firm pressure over the entire area of the wound. This is of especial value in the case of thyroidectomy wounds. It is our feeling that air trapped in the wound predisposes to the collection of serum or the formation of hematomas which predispose to infection.

Question Is ether poured in a traumatic wound harmful to the cells?

DR REID It most certainly is. In the first place it is not likely to kill all the bacteria and besides it kills or damages many cells which then serve as excellent food for the bacteria left in the wound. The harm of ether and alcohol upon living cells can easily be proved by their effect upon the growth of living cells *in vitro* by making a flesh open wound on a dog and pouring ether or alcohol into such a wound one can note its effect on subsequent days.

Question When should a primarily closed open wound be dressed and how often?

DR REID The answer to this question naturally depends upon the seriousness of the damage beneath the closed wound. In the case of soft tissue wounds it is our policy not to dress them until it is time to remove some of the sutures unless the patient complains of pain or develops a fever which might make the surgeon suspect that the wound has become infected. In the case of wounds in which there is a serious subjacent injury such as a compound fracture or the opening of a joint it is our belief that the dressing should be delayed considerably longer and that the harm of leaving in a few silk skin sutures longer than necessary is more than offset by the value of rest and non interference to the more important injured structures beneath the closed skin.

FINAL REMARKS BY DR McCLELPE

It has been a source of great satisfaction to me to listen to the tributes paid to my teachers the late William Stewart Halsted and Alexis Carrel whom we are fortunate to have here with us. We are all familiar with the far reaching importance of Dr Carrel's work on wound healing especially his contributions to the management of war wounds. Dr Halsted as you all know did pioneer work in the handling of surgical wounds. I wish to add my personal tribute to these men because of my long association with both of them.

When one reads the monograph *The Aseptic Treatment of Wound* published by Professor Schummelbach early in the 1890's one is filled with amazement at the miraculous saving of life and limb immediately after the realization by the then surgical leaders of the great value of asepsis. Some authorities believe that very little improvement has been made in the treatment of wounds since that time. However we know that much progress has been made in centers where the principles of asepsis have been strictly applied.

The question now arises as to whether further progress is possible. We believe as I stated in my opening remarks that antiseptics would not be so heartily condemned if search were directed toward the discovery of solutions which would be harsh to bacteria but kind to tissue cells. We know that such antiseptics are now being developed and investigated in various laboratories. Proof of their innocuousness is demonstrated by the fact that it is possible for them to be taken by mouth or to be injected intravenously without damage to the tissue cells. Further work must be directed along this line.

Another great advance is suggested in the treatment of gas bacillus infections. The creation of a high oxygen content in the blood and tissue cells by placing the patient in 100 per cent oxygen atmosphere offers great promise of advancing the treatment of this type of infection.

The thought I wish to leave is that we should not rest on our laurels or feel that further progress cannot be made.

DEEP INFECTIONS OF THE NECK

Collective Review

GORDON B NEW, M D, and JOHN B ERICH, M D,
Rochester, Minnesota

INTELLIGENT treatment of deep infections of the neck is founded on not only a broad personal experience in the therapeutic management of these conditions but also a comprehensive knowledge of present-day observations, opinions, and conclusions concerning their nature. A review of the literature may be somewhat confusing since one encounters contradictory statements regarding the course of these infections, conflicting anatomical terms particularly in reference to the cervical fascial planes, and differences of opinion as to the proper surgical treatment. This situation necessarily exists because medical men have approached the problems which arise in the management of infectious processes in the neck from divergent points of view. Then too, so many variable factors influence the course of these infections that principles of treatment are not reducible to definite rules which can be adapted to every case. No doubt, many of our present deductions will be modified and clarified by further research and observation.

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patient was three days of age the oldest seventy six years

Deep infections of the neck are invariably secondary to infections elsewhere in the body. Only in rare instances is a cervical abscess or cellulitis primary as for instance an infection following a traumatic wound or surgical operation on the neck. Occasionally a cervical infection is the result of a suppurative process in a distant part of the body from which the causative organisms are transferred through the blood stream. However the great majority of the cervical abscesses are secondary to some primary infection of the mouth ear nose or throat. Beck agreed with Mosher who expressed the opinion that the greatest single cause of these infections is in or about the tonsils. In 58 per cent of the 24 cases of cervical infection reported by Beck the infection was the result of inflammation of the pharynx or tonsils in 12 per cent it was the result of dental conditions and in 29 per cent it was the result of other causes. In 101 of our 267 cases (20) no cause for the cervical abscess could be ascertained. Analysis of the remaining 166 cases appears to sustain the statement made by Beck, Mosher and others that the most common single source of infections of the neck is tonsillitis 24 of the cervical infections in our series were secondary to tonsillitis and associated pharyngitis. In 110 of the 166 cases the cervical abscesses were the result of the following causes: infections of the mouth or jaws in 55 cases, dental extraction in 21 cases, infected teeth in 13 cases, osteomyelitis of the jaws in 7 cases, fractures of the jaws in 5 cases, gingivitis in 3 cases, stomatitis in 3 cases, infected tumors of the mouth in 2 cases and an oral operation in 1 case. Cervical infections rather frequently follow tonsillectomy rhinitis otitis and inflammatory lesions of the face and scalp. When the original source of infection is indeterminate we believe that in most cases there probably has been present in the ear nose throat or mouth a primary infection of such a low grade that it did not give rise to subjective symptoms and could not be detected clinically.

BACTERIOLOGY

Although the type and virulence of the invading bacteria are undoubtedly the most significant etiological factors probably no phase in the study of deep infections of the neck has received less attention from the majority of clinicians than the bacteriological aspect.

Pearse said the greater number of observers reported that in most of their cases the infection was the result of streptococcal involvement this

coincides with his own findings. Beck and Baker reported that in at least 50 per cent of their cases the infection was caused by the hemolytic streptococcus. Streptococci viridans staphylococci and pneumococci were found in some instances and mixed infections were common.

Bacteriological studies by Alden indicate that many types of organisms are present in a cervical abscess but in those cases in which the abscess is secondary to oral or dental infection the *Borrelia vincenti* always is the predominating organism. In fact this anaerobe was found in 24 of Alden's 26 cases and in 9 it was obtained in pure culture.

Boyne quoted Chatterji and De who made a study in India of cases of cellulitis they found that the dominant organism was the staphylococcus aureus which was of sufficient virulence to cause death in 60 per cent of their cases. Boyne also referred to the work of Fabrehat who recorded that the clostridium welchii is an important organism in the etiology of cervical infections.

In the bacteriological laboratory of Hyde it was discovered that in the majority of his cases of cervical cellulitis the organism most frequently encountered was the staphylococcus. However in his cases of Ludwig's angina he found a mixed infection of highly pathogenic bacteria with streptococci predominating.

Meleney has made extensive bacteriological studies of the purulent material obtained from cervical abscesses secondary to oral infections. He found that organisms ordinarily found in the mouth especially non-hemolytic streptococci could be obtained in most cases but by studying the material under dark field illumination he found that the fusiformis dentium and the *Borrelia vincenti* could easily be demonstrated. It is of interest to note that the *Borrelia vincenti* was nearly always present in cases in which the condition of the abscess was very severe but that it often was absent in those cases in which the infection was mild. By the use of special culture media Meleney was able to grow the organisms and he found that when the *Borrelia vincenti* was injected into animals in pure culture it was not pathogenic but when it was injected in combination with other organisms extensive lesions were produced. Meleney's studies indicate that when the infection is essentially due to hemolytic streptococci a cellulitis without necrosis of the tissues will develop the fever is high there is profound intoxication and the infection is likely to arise and subside rapidly. On the other hand when the predominating organism is the *Borrelia vincenti* much necrosis of tissue occurs the fever

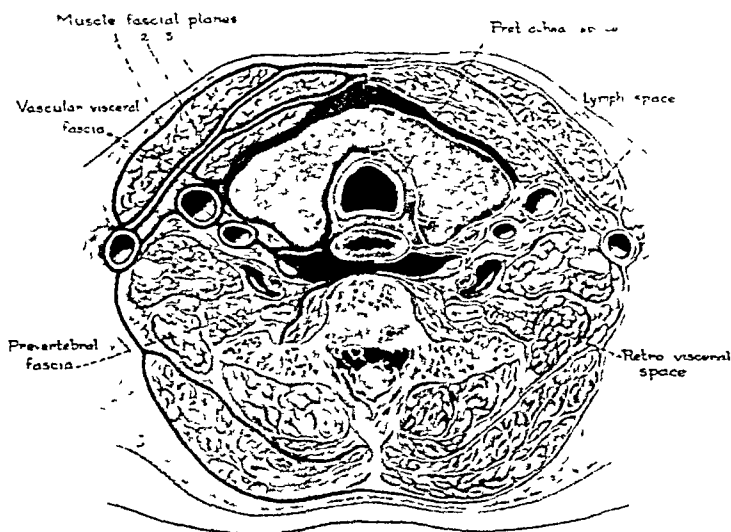


Fig 1 Horizontal section at the neck showing dissection of the fascial planes and spaces (Drawing from dissection by Collier, F. A., and Yglesias, Luis. The relation of the spread of infection to fascial planes in the neck and thorax. *Surgery*, 1937, 1: 327)

and intoxication are less severe than in the cases in which the infection is the result of streptococci, and the infectious process tends to develop and subside slowly.

Summarizing the bacteriological studies that have been recorded, it would appear that many types and strains of organisms will produce a cervical abscess or cellulitis under favorable conditions. Most frequently encountered in such suppurative conditions is the hemolytic streptococcus. In many cases the *borrelia vincenti* plays a prominent rôle. Only infrequently are such organisms as staphylococci, non-hemolytic streptococci, and pneumococci the primary cause of the inflammatory process, although they occur commonly in the mixed types of infection.

ANATOMY AND FASCIAL PLANES OF THE NECK

A clear conception of the pathology and course of cervical infections necessarily requires an appreciation of the anatomy and fascial planes of the neck. Recent laboratory investigations substantiate well-known clinical observations which suggest that the fascial planes tend to direct and limit the spread of pus in the neck. The cervical fascia consists of fibrous connective tissue which invests the organs of the neck, insheathes the muscles, nerves and vessels, fills the tissue interstices, and binds all of the cervical structures into

a working unit. In the words of Alden, "the ramifications of the cervical fascia are such that the neck is divided into a series of planes and potential compartments. By the term 'potential compartments,' I mean certain spaces which, under normal circumstances, are not open, but which, when invaded by an abscess, become true compartments because of the limiting action of the various fascial planes and other structures on their several sides."

Collier and Yglesias, and Furstenberg and Yglesias, in this country, and Barlow, in England, have done some excellent investigative work in demonstrating the cervical and mediastinal fascial compartments. Their conclusions are based on extensive and careful anatomical dissections of the cadaver and on the preparation of large serial sections, together with ingenious injection experiments in which they used opaque, liquid materials to visualize roentgenographically the spread and dissemination of fluids in the tissue spaces of the neck.

Collier and Yglesias divided the fascial planes into two types: those associated with muscles, and those surrounding viscera and vessels. The muscular fascial planes are always inserted into bone, they said, and this limits the spread of infection in these spaces. Since the viscerovascular fascial spaces extend along the viscera and ves-

sels infection may easily pass from one compartment to another and from the neck into the thorax

In addition to the prevertebral muscular fascia Coller and Yglesias described three muscular fascial planes in the neck (Figs 1 and 2). The first surrounds the neck and encloses the sternomastoid and trapezius muscles. The second encloses the sternohyoid and omohyoid muscles this plane is attached above to the hyoid bone below to the sternum and continues laterally around the neck between the trapezius and the deep vertebral muscles to be inserted into the ligamentum nuchæ. The third plane encloses the sternothyroid and the thyrohyoid muscles above it is attached to the hyoid bone below it is inserted into the manubrium and laterally it fuses with the sheath of the internal jugular vein. Beneath these three musculofascial planes and anterior to the prevertebral muscular fascia lies the viscerovascular space with its own system of fascia which leads directly into the thoracic cavity.

From a general anatomical point of view Barlow has visualized the neck as being composed of four units namely the vaginal vertebral visceral and great vessel.

The vaginal unit consists of the sternomastoid and trapezius muscles and the vaginal fascia (usually referred to as the superficial layer of the deep fascia) which splits to enclose the muscles. Barlow fancied this unit to be a musculofascial tube that encloses all of the other structures of the neck. Posteriorly the vaginal fascia fuses with the prevertebral fascia and anteriorly it is attached to the hyoid bone. In the suprasternal notch this fascial layer splits to form a fat filled pocket termed the space of Burns. In its upward course the vaginal fascia is fixed to the inferior border of the mandible passes under the lower edge of the parotid gland to form the stylo-mandibular ligament then proceeds upward external to the parotid gland to the zygomatic arch where Barlow said it has a loose attachment and continues on upward to the temporal ridge. From the stylo-mandibular ligament the vaginal fascia sends a thin fascial membrane to cover the mesial aspect of the parotid gland.

The vertebral unit is composed of the cervical vertebrae and associated muscles and the investing pretracheal fascia. Posteriorly the fascia of the vertebral and vaginal units fuse anteriorly and inferiorly the prevertebral fascia fuses with the fascia about the subclavian vessels to roof in the pleural apex.

The visceral unit includes all of the cervical structures except the great vessels which are

situated between the vertebral unit posteriorly and the vaginal unit anteriorly and laterally. It is interesting to note that Barlow included the suprahyoid and infrahyoid muscles among the structures of the visceral unit because they undergo longitudinal movements which he insisted are essential to the visceral structures during deglutition. Barlow visualized the vaginal unit as forming a sort of investment comparable to a tendon sheath for the visceral structures which act as a tendon and move up and down within the sheath.

Barlow referred to the ramifications of fascia which surround the visceral structures and form potential compartments as fascial condensations. Above there occur bilaterally three such fascial compartments worthy of much consideration. They are the submaxillary parotid and lateral pharyngeal (pharyngomaxillary) spaces.

The submaxillary space lies between the visceral fascia which covers the mylohyoid muscle and the overlying vaginal fascia. Contained within this space is the submaxillary salivary gland which Barlow said has its own fascial condensation in the form of a capsule.

The parotid space is formed by the vaginal fascia which is separated from the submaxillary space by the stylo-mandibular ligament and from the lateral pharyngeal fossa by the thin membranous offshoot of vaginal fascia from the stylo-mandibular ligament. Within the parotid space lie the parotid gland and the parotid lymph nodes.

The lateral pharyngeal space is a fat filled pyramidal shaped compartment $1\frac{1}{2}$ in (3.7 cm) in vertical length. Its base is situated at the base of the skull and its apex at the greater cornu of the hyoid bone. As described by Barlow it is bounded laterally by the parotid space and fascia anteriorly by the internal pterygoid muscle and the ascending ramus of the mandible mesially by the superior constrictor muscle of the pharynx which separates this space from the tonsil and posteriorly by the stylopharyngeus aponeurosis which covers the great vessels and which Barlow claimed is a strong barrier against the passage of infection between the lateral pharyngeal space and the great vessels. A direct communication exists between the lateral pharyngeal and the submaxillary spaces but no communication is to be found between either of these spaces and the parotid compartment. However the mesial limiting membrane of the parotid space is a rather poor obstacle to the dissemination of pus from the parotid space into the lateral pharyngeal space.

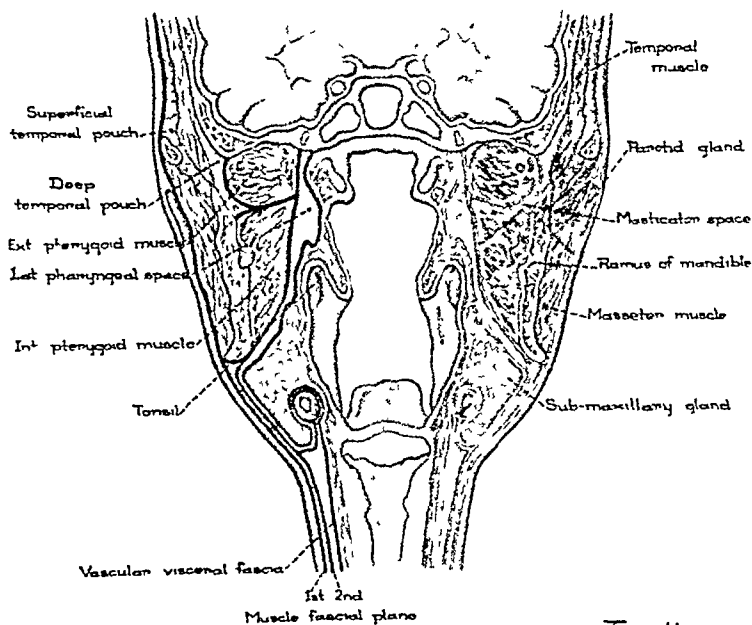


Fig 2 Frontal section demonstrating the different fascial planes and potential anatomical spaces (Coller, F A, and Yglesias, Luis Infections of the lip and face Surg, Gynec and Obst, 1935, 60 277)

Barlow referred to the visceral compartment between the prevertebral fascia, posteriorly, and the pharynx and esophagus, anteriorly, as the retrovisceral (also termed pretracheal and retropharyngeal) space. He claimed that this space is bounded laterally by condensations of fascia which run parallel with and $\frac{3}{4}$ in (1.8 cm) from the median line. Coller and Yglesias said that the retrovisceral space is continuous from the base of the skull to the diaphragm, although it may be partially or completely occluded at the level of the bifurcation of the trachea.

According to Barlow, fascial condensations surround the pharynx, esophagus, larynx, trachea, and thyroid gland. The upper portions of these condensations are referred to by Ford, Dorrance, and others as the "bucco-pharyngeal fascia." Coller and Yglesias said that the fascia surrounding the pharynx, esophagus, larynx, trachea, and thyroid gland forms a sort of compartment, which they termed the "pretracheal space"; this space, they said, ends below in the fibrous pericardium and encloses the aorta and its branches.

On either side of the median line and beneath the vaginal fascia and the infrahyoid muscles are two fascial compartments, which Barlow has named the "subvaginal spaces," and which con-

tain the deep cervical lymph nodes. Coller and Yglesias said that these spaces are triangular in outline, the base lying in the supraclavicular fossa and the apex extending up to the mastoid process of the temporal bone.

The "great vessel" unit consists of the fascia commonly known as the carotid sheath, and the carotid artery and the jugular vein. Anatomical studies by Barlow disclosed that the artery and vein each have a separate compartment in the fascial covering. He termed these compartments the "carotid" and "jugular" sheaths. The "great vessel" unit possesses no longitudinal mobility, but since its branches enter the mobile visceral unit, these branches run a very tortuous course. According to Scheldrup, there exists a bridge of fascia between the visceral fascia surrounding the respiratory and digestive tracts, and the vascular sheaths, and he termed this bridge the "alar" fascia. Alden made the statement that the carotid sheath emerges from the apex of the lateral pharyngeal space and, for all practical purposes, is a continuation of this fossa through the neck into the thorax. Beck considered the submaxillary, lateral pharyngeal, and parotid spaces to be in more or less direct communication with the carotid sheath, he compared these three spaces to

the leaves of a trifolium with the carotid sheath as the stem. However, the injection experiments of Barlow failed to show that the carotid sheath has any connection at all with these three fossae.

According to Furstenberg and Iglesias the thorax may be divided into three potential fascial spaces.

The first thoracic space lies in the retrosternal region. This space need not be considered in infections of the neck because it has no communication with fascial spaces in the neck.

The second thoracic space is a continuation of the pretracheal fascial space of the neck into the thorax. This pretracheal space communicates directly with that part of the mediastinum which lies between the arch of the aorta in front and the trachea posteriorly.

The third thoracic space is a direct communication of the retrovisceral space of the neck into the thorax. There is here a direct communication of a cervical fascial space with the posterior mediastinum.

Injection experiments which are designed to show the spread of pus from one fascial compartment to another in the neck are of interest. However it is well to keep in mind Barlow's statement: no injection technique can be strictly comparable to the spreading of pus in an active inflammatory process. The results of Barlow's injection experiments will be described in the following paragraphs.

Upon the injection of fluid into the lateral pharyngeal space it was found difficult to make the fluid burst into the submaxillary or parotid spaces. When fluid was injected into the submaxillary space however it readily escaped into the lateral pharyngeal space. When fluid was injected into the parotid space it extended upward toward the temporal region only when the fluid was injected under considerable pressure did it enter the lateral pharyngeal space. In no case did the fluid enter the carotid sheath after it had been injected into the submaxillary lateral pharyngeal or parotid space.

Fluid entering the retrovisceral space from above did not pass downward easily into the posterior mediastinum below the level of the third thoracic vertebra. Only when considerable pressure was used did the fluid penetrate into the subvaginal space.

The injection of fluid into the space of Burns revealed that as the pressure was increased the fluid entered the subcutaneous tissues.

The injection of fluid into the subvaginal spaces disclosed that the fluid did not cross the median line, did not enter the parotid lateral pharyngeal

or submaxillary spaces and did not enter the jugular sheath in only 1 case was there any sign of leakage into the thorax.

In reviewing all of Barlow's injection experiments one discovers that the injected fluid entered the mediastinum but rarely and then with difficulty, and that in no case did the fluid in the cervical fascial spaces find entrance into the jugular sheath.

The clinical value of the foregoing discussion on the cervical fascial planes will be given consideration in the following section of this paper.

PATHOLOGY

The majority of infections of the neck probably are the outcome of a cervical adenitis which in turn, excepting in those cases in which the infection is of hematogenous origin, is the result of drainage of infectious material from the primary lesion through the lymphatics. A cervical cellulitis represents a direct extension of the primary infection through the loose cellular tissues of the neck. Because the pharynx and oral cavity are frequently the primary source of infection it is reasonable to assume that the upper cervical regions and fascial compartments would be the most frequent sites of an infectious process. Thus we have found to be true, since in 166 or 66 per cent of our 267 cases the infection involved the submental submaxillary and upper cervical regions. In association with the study of the fascial planes much has been written on the relation of the limiting action of these planes to the spread of infection in the neck. Dorrance andurgeons as a whole agree with Havens that pus does not burrow along the fascial planes as frequently as anatomists would have one believe. No doubt the cervical fascial planes do tend to direct the spread of infection but there are also other factors which are concerned with the course of an infectious process in the neck. Pus is not an inert fluid which flows like water from one fascial space to another. On the contrary pus is an exceptionally active material that invokes many types of defensive reactions on the part of the involved tissues. Just as any other abscess in the body of an otherwise healthy person a cervical abscess tends to become walled off in response to the inflammatory reaction. In our experience the digestive enzymes produced in the purulent material tend to disintegrate the overlying tissues so that the abscess points to the surface. Although in some cases pus may burrow along the fascial planes this is not the usual course of events. It is interesting to read Ford's description of the parotid fascia in which he said that one is impressed by

the great tensile strength of the deep cervical fascia,—a sheath of fibrous tissue as tough as a whip-cord,—the dense parotid fascia with the trabeculae knitting the gland together like a Persian rug,—capable of sustaining a weight of two or three hundred pounds. This forced the realization that fluctuation in the neck at a sensible time is an impossible thing. Pus will not work through a 'cow hide' so to speak." Regardless of the strength of the parotid fascia, time and time again we have seen a parotid abscess break through the dense parotid fascia and drain through a sinus in the skin rather than penetrate mesially into the lateral pharyngeal space. Again, many authors speak of the dangers of pus in the cervical region draining into the mediastinum. Yet, a case in which mediastinitis was secondary to a cervical infection has never been seen among our patients at The Mayo Clinic (20) and, furthermore, few such cases have ever been reported in the literature. However, no matter how remote the development of mediastinitis may be, these findings neither preclude the possibility of mediastinitis developing in the presence of a cervical infection, nor belittle the seriousness of the complication.

The submaxillary triangle is one of the regions of the neck most frequently involved by infection. Infection of the submaxillary space may exist as a cellulitis, an adenitis, or an infection of the submaxillary salivary gland with secondary implication of the submaxillary fascial compartment. Much confusion has arisen concerning the distinction between the terms "infection of the submaxillary fascia" and "Ludwig's angina." Beck and others have referred to all infections in the submaxillary region as Ludwig's angina. Vickers used this term to denote a group of infections which may extend from the mucous membranes deeply along the lymphoid tissues of the pharynx and produce a diffuse swelling and hypertrophy of all the lymphoid and areolar tissues of the neck with explosive suddenness. According to Colp, Ludwig's angina "has been made to include almost every infectious process in the mouth and neck, especially if it terminates fatally." Most observers, we believe, agree that Ludwig's angina refers to a cellulitis of the loose, areolar tissues of the floor of the mouth, and that the process may secondarily involve the submaxillary fascial space.

Incidentally much discussion has taken place as to whether or not the term "Ludwig's angina" is a suitable name for the condition that it signifies. Colp said that the term is incorrect since Gensoul of Lyons, in 1830, was the first to describe this condition. Pearse agreed with Thomas,

who expressed the opinion that the term may be a misnomer but that "the time has not yet arrived when we can conveniently discard it."

Ford emphasized the fact that Ludwig's angina is a cellulitis and not a lymphangitis. This inflammatory process, according to Colp, is an active diffuse phlegmon, resembling a rapidly spreading cellulitis in which pus is unusual. Barnhill stressed dental infections and dental operations as the chief causes of this condition. The suppurative material from a dental root, said Dorrance, may follow the mandibular canal and find exit at the inferior dental foramen; it then passes down the mylohyoid groove beneath the periosteum to the sublingual tissues. When once infected, the loose areolar tissue of the floor of the mouth, Barnhill declared, does not offer the slightest resistance to the spread of the infection.

Beck divided infections of the submaxillary space into two groups: those of dental origin and those due to various other causes. Infected lower first and second molar teeth, Alden claimed, are the most frequent sources of infection of the submaxillary fascia. Pus in this region need not necessarily involve the submaxillary gland, according to Barlow, because the gland is protected by its own capsule of connective tissue. As recorded by Beck, Barlow, Dorrance, and others, the infection may not remain confined to the submaxillary compartment since it can easily enter the lateral pharyngeal space.

Infection of the lateral pharyngeal space is common, and on the authority of Ford, involvement of this space occurs in more than half of the cases of deep infections of the neck. Of Beck's 24 cases, the lateral pharyngeal space was involved in 58 per cent. He said that the primary source of infection in this region may be in the nose, paranasal sinuses, adenoids, pharyngeal lymph nodes, cervical vertebrae, mastoid cells, and the petrous portion of the temporal bone. Occasionally, infection of the submaxillary or parotid space may infect the lateral pharyngeal compartment. However, the most common source of infection is the tonsils. Beck quoted Waldapfel, who showed that infection of the tonsils or pharynx may penetrate the constrictor muscle of the pharynx and may, by direct extension along the veins, involve the lateral pharyngeal space. Very often this fascial compartment is infected following tonsillectomy under local anesthesia. Referring to the work of Shapiro, who has reported 103 cases in which pharyngomaxillary infection followed tonsillectomy, Barnhill asserted that the infection is due to direct contamination of the region because the needle used for the in-

jection of the solution of procaine is thrust through the infected tonsil into the lateral pharyngeal space. Ford who used Shapiro's classification said that infection of this fascial compartment may be of a phlegmonous type in which there are few if any local symptoms but in which there are evident signs of thrombophlebitis due to involvement of the internal jugular vein. Many clinicians consider involvement of the jugular vein associated with infection of the lateral pharyngeal space to be due to direct extension of the inflammatory process. However Barlow and Hickey and Popma claimed that since this space is separated from the carotid sheath by the stylopharyngeal aponeurosis infection may reach the jugular vein only by way of the smaller veins not by direct extension.

Parotitis and infection of the parotid space may be hematogenous in origin but as Vickers and Dorrance have affirmed in most cases of septic parotitis the patients are persons who have had abdominal operations and cannot or do not take fluids by mouth for a few days. This results in a dry mouth which in turn permits organisms to flourish in the oral cavity in time these bacteria work their way back through the parotid duct to infect the gland. Infections of the parotid space may penetrate the thin mesial fascial wall and infect the lateral pharyngeal fossa.

Seventy five per cent of infections of the retropharyngeal (retrovisceral, pretracheal) space occur during the first three years of life asserts Ford and generally follow some debilitating disease in connection with an infection of the upper part of the respiratory tract. The explanation of this statement, as made by Barnhill lies in the fact that the retropharyngeal lymph nodes are particularly well developed in children but disappear or become atrophied in adult life. Richards reported a mortality of 74 per cent in cases of retropharyngeal abscess. As has been previously described the retrovisceral space extends from the base of the skull to the diaphragm and is usually partially or entirely occluded at the level of the bifurcation of the trachea. Coller and Iglesias

said that infections of the retrovisceral space below this constriction are always secondary to lesions of the vertebrae and ribs or to perforation of the esophagus below this level. Infections above the constricted zone are secondary to infections of the ears nose or throat or to infections of the cervical or upper thoracic vertebrae the basilar process of the skull the petrosal bone or to perforation of the esophagus.

A retropharyngeal abscess may not remain confined to the upper portion of the retrovisceral

space but may gravitate downward produce edema of the larynx and sometimes rupture into the esophagus or trachea. Beck said that a retropharyngeal abscess may endanger the lateral pharyngeal space when it extends laterally. Injection experiments have led Barlow to believe that suppurative conditions in this region may enter the subvaginal spaces below the level of the hyoid bone where the lateral boundaries of the retrovisceral space are less strong. Baker said that a true infection of the median part of the retrovisceral space will extend into the posterior mediastinum.

Infection of the pretracheal fascial space is not common. Coller and Iglesias expressed the opinion that such infections are generally the result of infection of the lateral pharyngeal space of an inflammatory process in the lateral wall of the pharynx or of a perforation of the esophagus. Although rare thyroiditis may cause infection of the pretracheal space.

Suppurative conditions in the subvaginal space are common in connection with cervical adenitis and many authors believe that these spaces may become infected by purulent material from other fascial compartments.

Pere has never seen a carotid sheath filled with pus but has encountered infection gravitating down mesially and anteriorly to the vessel. He expressed the opinion that the pus burrows along the loose areolar tissue beside the vessels rather than runs down within their sheaths. As stated by Barnhill the carotid sheath may be infected from broken down infected lymph nodes from perforation of the esophagus or from the accumulation of pus in any one of the fascial spaces. Barlow by experimentation has found that phlebitis of the jugular vein is the result not of direct extension of a suppurative process into the jugular sheath but of the trans mission of purulent material along the sheaths of some of the smaller venous branches to the jugular vein.

SYMPTOMS

Infections of the neck are generally marked by an insidious onset of symptoms soon to appear are signs of toxemia which progressively increase in severity. The temperature which is only slightly elevated at the beginning of the process rises day by day until a peak is reached after which it gradually falls. Chills and sweats may accompany these symptoms. Locally a brawny indurated region of inflammation is noticed at first. Swelling redness and pain gradually become more marked until fluctuation of the involved region is finally evident. In some in-

stances the infectious process may run a very rapid course and fluctuation may appear in four or five days. However, in other cases the infection may be very indolent, with board-like infiltration, and a month or two, or even a longer time, may elapse before signs of suppuration can be noted. In our (20) series of 267 cases, the average time between onset of infection and the period at which fluctuation occurred was about three weeks.

When a cervical abscess lies near or adjacent to the upper part of the digestive or respiratory tract, sufficient edema may occur to make deglutition difficult if not impossible. Respiration is labored, and in an occasional case the dyspnea may be severe enough to necessitate tracheotomy.

Symptoms produced by involvement of the submaxillary, lateral pharyngeal, parotid, retropharyngeal, pretracheal, and subvaginal spaces, and of the carotid sheath require special consideration.

Cellulitis involving the submaxillary region is to be distinguished from Ludwig's angina. Most observers agree that Ludwig's angina runs a much more rapid course than infection of the submaxillary space. In reference to the former condition, Dorrance said that "in less than eight to ten hours a comparatively minor swelling of the neck becomes a serious surgical problem with a grave outlook." Colp said that before the submaxillary triangle actually becomes involved in Ludwig's angina characteristic objective signs may be noted. There is present a stony hard swelling in the submaxillary region, the overlying skin is edematous but not reddened, and fluctuation is usually absent. In the floor of the mouth, edematous swelling and induration are apparent. Partial trismus may be encountered, and the tongue is elevated and motionless. If the abscess in Ludwig's angina, according to Barnhill, is confined to one side, the tongue is pushed over to the opposite side, if the condition is bilateral, the tongue will be crowded against the roof of the mouth and back over the glottis so as to produce marked respiratory embarrassment in some cases. Barnhill quoted Blassingame, who said that "the floor of the mouth is so greatly swollen as to give the appearance of a second tongue."

Hyde has made some very careful observations concerning the differential diagnosis of Ludwig's angina and cellulitis of the submaxillary space. He said that a true Ludwig's angina presents an evenly colored skin over the diffuse swelling which is painful to touch over its entirety. However, in cases of infection of the submaxillary space the overlying skin is reddened and there is usually one point of extreme tenderness. When submax-

illary cellulitis is incised much pus is obtained, in true Ludwig's angina pus formation is rare.

It was Beck's opinion that in cases in which infection of the submaxillary space is of dental origin, the prognosis is good and the infection yields promptly to submaxillary drainage, but in those cases in which the infection is not of dental origin the condition is insidious and dangerous.

The cardinal symptoms of infection of the lateral pharyngeal space, as affirmed by Beck, are trismus, swelling over the parotid gland, and displacement of the tonsil and palatal arch on the affected side to the median line. The uvula may point almost horizontally, he said, to the opposite side. There is no enlargement of the tonsil itself unless it too is involved in the inflammatory process. This point is of diagnostic value in the differentiation of a paratonsillar abscess from an infection of the lateral pharyngeal space.

Barnhill said that external fluctuation at the angle of the jaw seldom is present in cases of infection of the lateral pharyngeal space. He expressed the opinion that infections in the fascial compartment have a greater tendency to descend downward around the carotid sheath than to point to the surface.

The local signs and symptoms of infection of the parotid space are well known. Pressure on the gland may express purulent material through the parotid duct into the mouth. This is often of diagnostic significance.

As outlined by Collier and Yglesias, infections of the retrovisceral space produce dysphagia, dyspnea, and dysphonia. A bulging pharyngeal wall can be noted, and fluctuation may be present. Roentgenological examination will show an increase in the width of the retrovisceral space in both the anteroposterior and lateral projections. These authors said that among children the chief symptom is dyspnea. Barnhill warned against palpation of retropharyngeal abscess in infants and children, since the examining finger may split the soft palate, or may rupture the abscess and cause danger of suffocation.

Torticollis may arise from infections in the subvaginal space or from infections about the carotid sheath. Black declared that torticollis resulting from infection under the sternomastoid muscle is toward the opposite side, and that resulting from infection along the paravertebral and trapezius muscles is toward the same side.

In reference to infections of the carotid and jugular sheaths, many authors claim that tenderness along the course of the carotid and jugular vessels is of importance, but Beck said that one should not be guided by the presence or absence

of local signs in diagnosing infection of the jugular sheath. Rather one should rely on the degree of sepsis. He further emphasized the fact that phlebitis of the jugular vein can take place early in the course of a cervical infection.

TREATMENT

With regard to the treatment of deep infections of the neck there are two schools of thought each of which claims satisfactory results.

There is one group of surgeons who advocate radical surgical procedures early in the course of these infections. It is their conviction that wide anatomical dissections are necessary to gain sufficient exposure of the infected fascial compartment then by the establishment of adequate drainage the infection is prevented from spreading into other visceral and vascular fascial spaces. The ultimate result these men believe is the reduction of complications to a minimum.

Another group of surgeons favor very conservative methods of management. The essence of their treatment of cervical infections is the delay of drainage until fluctuation can be detected or until the process is well localized. To incise an inflammatory process before it has become walled off they are convinced not only exposes healthy tissues to infection but also invites secondary invasion by pathogenic organisms from the outside. It is their conclusion that complications are more likely to occur if radical measures are instituted than if conservative methods are employed.

The important consideration in the radical treatment of infections of the neck is the anatomical approach for drainage of the numerous fascial compartments and planes.

For drainage of the submaxillary and the lateral pharyngeal spaces Collier and Yglesias recommended a long straight skin incision 1.5 cm. below the lower border of the mandible while Beck favored Mosher's T shaped incision. Either of these incisions will give adequate exposure for exploration of the submaxillary space. They also allow for palpation of the lateral pharyngeal fossa by inserting the index finger up under the submaxillary gland and then thrusting it through the natural opening into the lateral pharyngeal space one is able to make a digital examination of all the structures associated with this compartment. After the skin incision has been made blunt dissection is advocated by most surgeons.

Suppurative processes not of dental origin in the submaxillary space require early drainage according to Beck. If either the submaxillary triangle or the lateral pharyngeal space is involved by infection Colp declared that the submaxillary

gland must be removed in order to obtain free drainage. However most observers do not agree with Colp on this point. In some cases of infection of the lateral pharyngeal space in which there is present a definite region of pointing into the pharynx and in which suppuration is suspected Ford advised incision directly behind the posterior tonsillar pillar and an attempt to find the pus by the use of a blunt instrument should this procedure fail the external approach is used.

Much has been written about inflammatory involvement of the jugular vein in cases of infection of the lateral pharyngeal fascia. Ford quoted Shapiro as stating that a chill followed by a sharp rise in temperature during the course of an infection of the lateral pharyngeal fascia should be regarded with suspicion and said that repetition of these symptoms within twenty four hours calls for exposure of the jugular vein. Through either of the incisions described previously one can obtain an excellent exposure of the vein within or below the lateral pharyngeal fossa.

If the abscess in cases of Ludwig's angina lies above the mylohyoid muscle Ford recommended evacuation by an incision in the floor of the mouth if it is below this muscle he recommended a deep external incision. Colp said that the old empirical median line incision in the submental region must be discarded as the infection is practically never situated in the median line. For exposure of the tissues in the floor of the mouth he advocated the use of local anesthesia and advised the use of a lateral incision in the submaxillary region the cut being made upward and across the fibers of the mylohyoid muscle to avoid a cut across important structures in the floor of the oral cavity. When the submaxillary space is involved in Ludwig's angina Pearse said that the success of surgical treatment rests on the release of pressure in this fascial compartment and Colp insisted that the submaxillary gland must be removed to allow for free drainage.

Involvement of the pretracheal space secondary to hypopharyngeal infections according to Beck can be drained within the throat provided that care is taken not to injure the superior laryngeal nerve when the incision in the piriform fossa is made. If internal drainage does not check the progress of the infection external drainage is indicated. Collier and Yglesias said that drainage of the pretracheal space is best carried out through an incision along the anterior border of the sternomastoid muscle at any desired level between the hyoid bone and the sternum. The incision being carried through the three anterior muscular fascial planes the thyroid gland is

exposed and lifted aside after incision of its fascia, then deeper, the pretracheal fascia is encountered and on incision the pretracheal space is laid open.

Most surgeons agree with Beck that in cases of retropharyngeal abscess without respiratory embarrassment simple peroral incision for drainage is usually effective. If severe dyspnea develops, tracheotomy may be necessary. In some cases of retropharyngeal abscess a pharyngeal incision will not give adequate drainage, in such cases, Scheldrup advised an external approach to the retrovisceral space. He used a skin incision along the anterior border of the sternomastoid muscle, and exposed and retracted the great vascular sheath laterally. This puts the alar fascia (fascia between the carotid sheath and the pretracheal fascia) on the stretch, a blunt instrument passed through this fascia enters the retrovisceral space without injuring the vessels or nerves. Moreover, this approach makes finger exploration of the retrovisceral compartment possible for a considerable distance superiorly and inferiorly.

For infections of the carotid and jugular sheaths, many methods of approach have been advocated. Scheldrup has prepared an excellent detailed account of the incisions and dissections necessary for access to the carotid artery and jugular vein at various levels in the neck.

Many surgeons, who stress the necessity of radical measures and of early operation in the treatment of infections of the neck, are very emphatic in their disapproval of conservative management. Beck said that if the deep lymph nodes are involved by infection, extension is to be expected and the compartments invaded must be drained. He said further that delayed operation is liable to be disastrous and engender regret. According to Colp, the mortality rate in Ludwig's angina and infections of the submaxillary space is 40 per cent, because operation is instituted too late or drainage is inadequate. Boyne believes that neck infections regardless of the part involved, must be considered potentially fatal.

Surgeons who favor conservative types of treatment cannot agree with these statements. In our group of 267 cases, conservative treatment was employed with very satisfactory results. In fact, there were but 8 deaths in the entire group, and in only 2 cases, 0.7 per cent, could death be attributed to the cervical infection. Our method of treatment (20) is as follows:

"Patients who have cervical infections are put to bed and large hot, moist dressings, which are changed hourly, are applied over the involved region. If inflammatory edema of the mouth or throat is present, hot irrigations are used. When

a patient has great difficulty in swallowing or is unable to do so, a Rehuss feeding tube is inserted through the nose into the stomach so that sufficient intake of fluid can be maintained.

"If edema of the hypopharynx or larynx is present, but is not of sufficient magnitude to cause severe dyspnea, steam and an oxygen tent are helpful. However, when dyspnea is pronounced, no time is lost in opening the trachea. In performing tracheotomy, if it is necessary to open the infected region in order to reach the trachea, the wound is packed and maintained widely open with iodoform gauze. Six of our cases required tracheotomy, five of which were reported by one of us (New) (19).

"Drainage of the abscess should not be undertaken before fluctuation is present or the abscess localized. If the abscess is situated deep in the neck, it is frequently difficult to detect fluctuation, and under such circumstances, the opportune time for drainage must be governed by the general symptoms, duration of the phlegmon and a conviction on the part of the surgeon that pus is present deep in the neck. Frequently, deep fluctuation may be present beneath the sternocleidomastoid muscle or deep in the submaxillary region. Preferably drainage is carried out among adolescents, older children and adults, under intravenous anesthesia using pentothal sodium, among infants and young children, gas anesthesia is safer than intravenous anesthesia. However, at any age, if there is any obstruction to the respiratory tract, the patient should never be put to sleep, for fear of inducing complete obstruction. In such cases, a spray of ethyl chloride is used as a local anesthetic. A small incision is made through the skin overlying the fluctuant region, and through this incision, a curved hemostat is thrust into the abscess. On no occasion has severe bleeding occurred at the time of drainage owing to opening into a large blood vessel. After evacuation of the pus, a drain consisting of a fairly stiff rubber tube is inserted and is retained in position by sutures. Occasionally, in dealing with large cavities, the wound is packed lightly with iodoform gauze which is left in place for twenty-four to forty-eight hours. The drain is not removed until seven to ten days after insertion.

"At the time of drainage, it should be kept in mind that the infectious process may be actinomycotic or tuberculous in nature. The yellow sulfur bodies so diagnostic of actinomycosis should be searched for carefully throughout the purulent material. The caseous material and granulations found in tuberculous abscesses are well known."

We believe that a woody phlegmon, in which pus does not form, should never be incised even though it requires months to subside or to undergo uppuration. Hot dressings and roentgen therapy are useful aids in the treatment.

In the conservative management of deep infections of the neck the facial planes really are of little importance. Although they should tend to determine the primary situation of the infection in the neck the barrier produced by the wall of the abscess is of considerably more importance than the fascial compartments and planes.

Hicken and Popma favored a conservative form of treatment for cervical infections and said that the therapeutic errors in the local management of suppurative adenitis are not those of omission but rather of commission too early and inadequate drainage are two important mistakes.

In the conservative treatment of infection of the parotid space or parotitis Vickers said that the best treatment is prophylaxis by the use of chewing gum especially in cases in which the infection is secondary to operations on the stomach or peritoneum. This stimulates the flow of saliva and decreases the likelihood of gland infection.

As reported by Roehm, Boyne and Dorrance irradiation has proved its value in the treatment of many deep infections of the neck especially parotitis cellulitis and adenitis. Irradiation in the early stages allows many infections to subside without suppuration (Dorrance).

Because bacteriological studies have proved that the *Borrelia vincenti* is frequently an offending organism in cervical infections secondary to diseases of the mouth Alden and Boyne have administered neocarsphenamine as a therapeutic measure with much success. They said that in some cases the inflammatory mass subsides entirely without further treatment. Alden has even adopted the practice of giving neocarsphenamine in the treatment of all types of cervical infections whether or not *Borrelia vincenti* can be demonstrated. Boyne said that at times the results seem almost miraculous and he was certain that a number of his patients were saved from external drainage by the use of this drug.

In cases of infection in which the tissues have been opened by adequate operation Meleney declared that the infection can be brought under control by careful application of zinc peroxide suspended in sterile distilled water. If this is done he said that the foul odor will almost immediately disappear and smears and cultures of the exudate will show rapidly decreasing numbers of fusiform bacilli, Vincent's spirochetes and anaerobic streptococci.

COMPLICATIONS

By employing a conservative type of treatment we have witnessed very few complications in deep infections. Erysipelas occurred in 4 of our (20) cases but disappeared after irradiation.

A possible complication is hemorrhage due to sloughing in the wound with involvement of larger blood vessel. Barnhill reported a case in which fatal hemorrhage was due to erosion of a large vessel, and Alden observed cases in which the external maxillary artery was involved.

Perhaps among all the cervical infections hemorrhage is never more serious than in a case of retropharyngeal abscess. Havens quoted Lifschutz who collected reports of 3 cases in which hemorrhage was secondary to retropharyngeal abscess. In this series there were 19 deaths. The diagnosis of retropharyngeal hemorrhage may be difficult because the bleeding may be in the cavity of an unruptured abscess. According to Havens (14) enlargement of a retropharyngeal mass in a few hours is significant. It may mean erosion of a large vessel although no blood is appearing on the surface. If such a condition is suspected aspiration before incision would be wise. In the word of Ford The light sign of hemorrhage in the presence of a retropharyngeal abscess is an indication of danger and calls for immediate action as it may be followed at any moment by a sudden fatal hemorrhage. In such event packing and pressure have little effect and ligation of the internal or common carotid is the only alternative. Some surgeon may hesitate to ligate the internal or common carotid artery for this condition but Havens said that most patients who require this procedure are young children and the risk of circulatory complications secondary to ligation is slight in comparison to the danger of fatal hemorrhage without it.

Probably no complication of cervical infection has received as much attention as jugular thrombosis and without question it is a serious complication. However with the use of conservative method of treatment of deep infections of the neck we believe that thrombophlebitis of the jugular vein is uncommon. In our (10) entire series of 267 cases we observed but 1 case of jugular thrombosis. Chase has made a thorough review of the literature on this important subject. Many men are of the opinion that infection in any of the fascial spaces may lead to jugular thrombosis. As far as the pathological changes of venous thrombosis are concerned Chase said that there is first a local infective process which is complicated by an infection of the veins returning from that region which tends to extend along

the vessels, from the smaller to the larger, in any direction and does not tend to become localized. The results of thrombophlebitis of the jugular vein, according to Chase, are further extension of the infective process into the surrounding regions that normally would escape infection, and a general infection of the blood stream, with septic foci scattered throughout the body. He said that in these cases the patients often give a history of having been subjected to repeated incisions for drainage of the localized abscess, no pus being obtained, or a local abscess may have been freely evacuated without relief of the septic symptoms. The diagnosis rests upon the presence of an inflammatory process extending along the large venous channels of the neck and upon definite embolic symptoms associated with a picture of grave general sepsis. According to Beck, chills, sweats, and high temperature are common symptoms and do not necessarily require jugular resection unless they continue some days after adequate drainage has been established, however, they demand immediate drainage of the fascial compartments. When the patient shows signs of much sepsis, blood cultures should be made early in the course of the disease, because of the possibility that negative results will be obtained after the vein is blocked by the thrombosis. Beck said also that blood cultures are most likely to be positive if the blood is taken during or immediately after a chill. One should not rely on the external signs in diagnosing jugular thrombosis, but should depend on the degree of sepsis. In reference to the prognosis of phlebitis of the jugular vein, Chase said that if the condition remains unrecognized and untreated, it is fatal in nearly 100 per cent of the cases. He places the mortality rate at 50 per cent in all cases in which the open method is used and said that infective phlebitis always presents a higher mortality than infective thrombophlebitis. In treating phlebitis of the jugular vein, it is generally recommended that the infected vein be ligated, thrombosed portions should be resected.

Many men have considered the danger of mediastinitis as a complication of cervical infections. However, very few instances of this complication have been reported, and, as previously stated, the complication has not been seen at the clinic. In the majority of cases of mediastinitis reported, the condition involved the retrovisceral space and was due to perforation of the esophagus by a foreign body that had lodged in the gullet, or by a stab or gun-shot wound. As stated by Black, the symptoms in these cases are extreme

dysphagia, pain, and fever, followed by swelling and tenderness at the base of the neck. If there has been a perforation of the esophagus, initial emphysema at the base of the neck may be present. Pearse said that should one suspect an esophageal fistula, and the patient is given a small amount of methyllithionine chloride (methylene blue) to swallow, the appearance of the dye on the dressings of the neck following operation will verify one's suspicions. In cases of perforation of the esophagus, Pearse declared that no difficulty will be encountered from persistent fistula or stricture. He said that the superior mediastinum, above the bifurcation of the trachea, is best drained through the neck. This is true particularly if pus has run downward from the cervical region, and, if the patient be tilted into a Trendelenburg position, it may be made to run upward. He asserted that dependent drainage must be obtained, this means keeping the patient's head down until drainage diminishes or ceases. Failure to do this will permit the formation of a residual abscess. When infection of the retrovisceral space has passed downward to, or has originated below, the fourth thoracic vertebra, Coller and Yglesias said that drainage should be carried out by external thoracotomy and resection of a segment of a rib.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Evans W H. Thrombosis of the Lateral Sinus. A Survey of Current Opinion and Records. *Arch Otolaryngol* 1938 28 959

While thrombosis of the lateral sinus is the intracranial complication most frequently encountered after operations for mastoiditis the number of cases observed by the average otologist is so small and the diversity of opinion in the medical literature for the management of this serious condition is so great that Evans drew on the larger collective experience of his confreres in formulating criteria for its management. A questionnaire addressed to approximately a thousand physicians and hospitals brought 341 replies. From this correspondence a collective series of 59850 cases of mastoid disease was compiled with 1556 cases of thrombosis of the lateral sinus an incidence of 2.6 per cent. Only 92 replies contained specific information regarding mortality 303 deaths (a mortality of 35.2 per cent) occurred in a series of 979 cases of thrombosis.

In general the incidence of thrombosis seems to be higher in children's hospitals and charity hospitals and in private practice largely among referred patients. There is no evidence either from the correspondence or a survey of recent literature that the type of treatment influences the mortality. This seems to be affected more by the age of the patient the virulence of the infection and the presence or absence of complications. It is questionable whether climate has any influence on the incidence of thrombosis of the lateral sinus although it may affect the incidence of mastoid infection itself.

Despite the growing number of authors who oppose operative intervention on the jugular vein in the treatment of thrombosis of the lateral sinus the survey shows that exposure of the sinus with ligation of the jugular vein is still the method of choice of a preponderant number of otologists. This surgical procedure is accompanied by transfusions and the administration of penicillin, serums, tonic and drugs such as sulfamidamide. Evident disagreement exists concerning the wisdom of attacking the jugular vein the efficacy and effect of transfusions and the role that sulfamidamide should play in the treatment of this condition.

Since the experience of the individual otologist with thrombosis of the lateral sinus is necessarily limited by its comparative rarity Evans believes that the only way in which additional knowledge and improved management can be acquired is by the collective experience of the members of the

medical profession. He pleads for careful observations and complete and accurate records. The individual otologist can hope for improved results in a condition in which the mortality is approximately one third only if the collective experience and wisdom of the members of the profession is available to him.

DOUGLAS D. FABRICANT, M.D.

Kazanjian V H. Ankylosis of the Temporomandibular Joint. *Am J Otolaryngol* 1938 24 1151

This article presents a clinical study of 33 cases of chronic ankylosis of the jaw. The cases may be divided into two groups: those in which the ankylosing factors lie in the joint proper (intra-articular or true ankylosis (28 cases) and those in which the pathology lies outside of the joint proper (false ankylosis (5 cases). Complete ankylosis is taken to mean less than 5 mm of opening power. The ankylosis may be unilateral or bilateral.

The predisposing cause is either disease or trauma. Infection may have occurred in the joint itself in a suppurative process in the neighborhood of the joint in the mandible in the middle ear or in the mouth. So-called congenital ankylosis at present considered as evolving from a birth injury and thus to be traumatic in origin. Injury is the most important single cause of ankylosis and was present in 8 of the 28 cases of intra-articular ankylosis. Half of these cases of intra-articular ankylosis had their onset in the first ten years of life. The second decade gave rise to 4 cases and the following decades to 6. The etiological factor or factors were well defined in the author's 5 cases of extra-articular ankylosis. Post-radiation injury and scarring following the treatment of intra-oral carcinoma accounted for 2 cases; injuries involving the coronoid process caused 2 cases and postdiphtheroid intra-oral scars caused 1 case.

The duration of the ankylosis is the etiology and roentgen studies are of some help in forming a pre-operative estimate of the pathology but in general one must wait for the surgical exposure of the joint before an accurate picture is obtained. It is important to know that in these cases even with complete ankylosis for many years the unaffected opposite joint remains perfectly normal. Bilateral cases of ankylosis are rather infrequent (4 in this series) and usually follow rheumatoid arthritis or injury in which the traumatic force is transmitted to both joints of the mandible. There were 11 cases of partial ankylosis and 17 cases of complete bony ankylosis. True osteomas extending either from the posterior surface of the head of the condyle or the

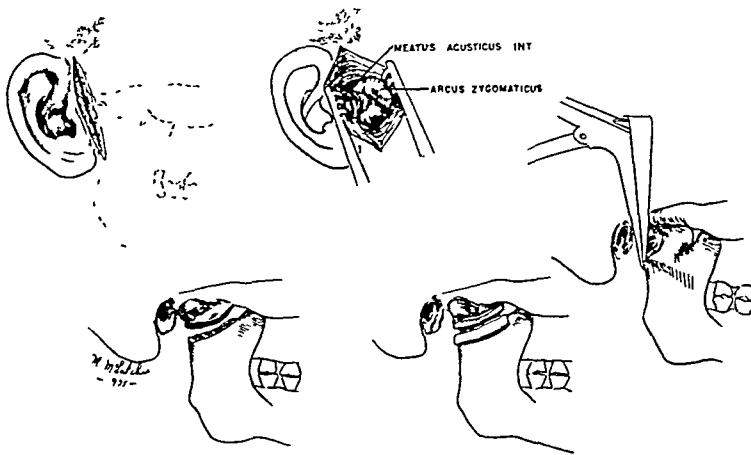


Fig 1 Diagram showing the various steps in the operative procedure for arthroplasty of the temporomandibular joint. Incision line, exposure of operative field, position of the back biting forceps at the initial cutting, the line through which definite section of bone is removed, a sufficient amount of fascia is inserted between the cut ends of the bone to eliminate "dead" space

coronoid process are especially noticeable in cases of partial ankylosis. The overgrowth of bone is primarily responsible for the limitation of motion. When the ankylosis is complete the hypoplasia of the mandible is most distinct. There are two explanations offered for this hypoplasia. The first is that the ankylosed joint directly affects an important growth center in the condyle and thus interferes with normal growth. The second is that lack of proper function leads to the hypoplasia. There is considerable evidence that interference with normal growth centers is the most important factor. Moreover, in bony ankylosis the unaffected side grows almost to normal size despite the fact that it has been largely deprived of its function. In complete ankylosis there is often a very great degree of decay on the occlusal surfaces of the teeth. Patients suffer but slight difficulty with their speech. The limitation in jaw function, the poor mouth hygiene, and the deformity are the main factors of disability. With the extra-articular lesion the joints themselves are normal and the jaw glides forward equally on both sides and with no deviation to the left or right. With an intra-articular ankylosis there is no forward motion on the affected side and this results in a slight deviation of the chin to the affected side. In bilateral ankylosis (intra-articular), no forward thrust is possible. This valuable sign can generally be elicited. Slight opening and lateral movement are always possible because of the elasticity of the mandible itself, even with complete bony ankylosis. Roentgen studies of both joints must be made. In the early cases of intra-articular ankylosis the shortening of the ramus on the affected side is notable. Blair has described the presence of a deepened preangular notch on the affected side in these cases.

Mechanical devices may be of value in extra-articular ankylosis, but are of no value and should not be employed in the intra-articular variety. No forceful opening of the mouth under anesthesia should be employed since the damage predisposes to firmer ankylosis. Surgery should be used as soon as possible in the intra-articular ankylosis. The youngest patient in this series was five years of age. In bilateral ankylosis only one joint should be operated upon at a time. In 1 instance two years elapsed between operations. No mouth gags or dilators are needed. If retrusion of the jaw is present, this is corrected at a later date. Dangers to be avoided in the operations are injury to the facial nerve, the internal maxillary artery, and the rich venous supply in the region of the joint. High section on the ramus of the mandible is necessary for optional functional results. The technique is illustrated in Figure 1. Anesthesia requires nasal or oral tubes with aspiration apparatus at hand. Rectal anesthesia has also been employed. Postoperative rest for the jaw is enforced for one week. No patient was hospitalized for more than three weeks. Deformity of the jaw may be corrected in the same manner as similar deformities are corrected following osteomyelitis, fractures, or other causes.

MANUEL E. LICHTENSTEIN, M.D.

EAR

Tumarkin, A. A Contribution to the Study of Middle-Ear Suppuration, with Special Reference to the Pathology and Treatment of Cholesteatoma. *J Laryngol & Otol*, 1938, 53, 737.

Tumarkin challenges the assumption that the outer layers of a cholesteatoma are demonstrably

epidermic in nature believing that there is nothing in the keratogenic power of cholesteatoma to prove an origin from epidermis. He suggests that the word cholesteatoma should be abandoned. Certainly the presence of cholesterol crystals cannot in any way be considered as specific since they are found in all kinds of chronic accumulations.

A proposed new classification for inflammations of the middle ear cleft places the infections of ciliated epithelium under the general heading of meso tympanic infections. In the case of pavement epithelium further subdivisions are: epitympanic (attic), retrotympanic (mastoid) and pre-tympanic (petrous) infections. Any such classification has the usual disadvantage that there is often a continuous gradation between different groups, rendering it impossible to draw a sharp dividing line between acute suppurative and acute catarrhal otitis media. Nevertheless each is a well defined clinical entity.

The author attempts to stress the essential difference between the two epithelia by the use of different adjectives. Thus the ciliated epithelium reaction is either catarrhal or suppurative. The comparable reactions of the pavement epithelium are either the desquamative or the perforating. For clinical completeness, gross suppurations in the epitympanum, retrotympanum and pre-tympanum are included. Strictly speaking these are not reactions of the pavement epithelium but of the underlying bone. Reactions in the sub groups of epitympanitis, retrotympanitis and pre-tympanitis are practically identical and in each case there is a chronic enclosed infection yielding the condition known as primary cholesteatoma. When the condition perforates the standard type of secondary cholesteatoma ensues.

In discussing the differences between his own theory and the metaplasia theory the author denies the extraneous or fortuitous origin for primary cholesteatoma as well as for secondary cholesteatoma. He denies that metaplasia takes place and affirms the identity of all posterior superior perforations. Koerner's criteria are in no way regarded as proof that the condition is of congenital origin.

Tumarkin describes his personal experiences with 9 cases of transmeatal atticotomy. These had resisted the most persistent conservative treatment for any where up to six months and would normally have been subjected to one or another of the major mastoid operations. The author claims that transmeatal atticotomy can cure certain cases of otorrhea which have resisted persevering conservative treatment. The only reservations are that there should be no evidence of intracranial complications and that the mastoid should be of the acellular variety. The operation is a comparatively minor procedure quite safe and may be performed on out patients. A hos-

pital stay of from one to three days may be required in some cases. Even when it fails a subsequent mastoid operation will be found much easier than usual and more likely to achieve functional improvement. The functional results are likely to be much better than those which would be obtained from any other operation.

NOAH D. FABRICANT, M.D.

NECK

Krapf, H. Cervicofacial Actinomycosis. Its Treatment and Prognosis. (Die cervico faciale Aktinomykose Ihre Behandlung und Prognose). Erlangen Dissertation 1938.

The author evaluates his experiences in 29 cases treated for actinomycosis about the face and throat at the Surgical University Clinic of Erlangen during the years from 1921 to 1937. He was able to recheck a part of the material.

In 3 additional cases the infection was located respectively in the thoracic wall, the inguinal region and the upper abdomen. The last mentioned case probably caused by a stab wound acquired a long time ago, healed completely. In the other 2 cases general infection occurred and both patients died within a year.

In his summary based upon the most important clinical pictures the types of treatment and the extension of the actinomycosis, the author expresses his opinion that actinomycosis is caused by organisms lying somewhere between bacteria and fungi but more nearly resembling bacteria. The portal of entry is chiefly the mouth and pharynx; the actinomycosis invader is ingested along with plant particles. A transmission from person to person or from animal to animal cannot be assumed. The incubation period could not be determined. Actinomycosis is almost exclusively limited to dwellers in the country. Repeated occurrence was observed in North Germany particularly Pomerania. Damp climates are more favorable to the fungi than dry climates. The prognosis for the cervicofacial type is more favorable when the condition is recognized early. Spontaneous healing may sometime follow exclusion of the glands. Treatment should be begun immediately on the slightest suspicion that the condition be present. A general remedy does not exist. The treatment should consist of a logical combination of surgery and iodine and irradiation therapy. By means of this régime 25 of 29 cases were cured, 2 are showing improvement and 2 in which the actinomycosis was very extensive terminated fatally, 1 from metastasis to the brain. The literature is almost entirely limited to that appearing during the twentieth century.

(HEINEMANN GRUENDER) NOAH D. FABRICANT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Martland, H S Spontaneous Subarachnoid Hemorrhage and Congenital "Berry" Aneurysms of the Circle of Willis *Am J Surg*, 1939, 43 10

In 10,000 routine autopsies made by the Office of the Chief Medical Examiner of Essex County, New Jersey, 7,500 deaths were attributable to homicide, suicide, automobile accidents, and other forms of violent death. Twenty-five hundred deaths were sudden and unexplained, but were ultimately found to be due to natural causes. Of these, 54 were found to have occurred as a result of spontaneous subarachnoid hemorrhage. Post-mortem examination of the 54 patients revealed ruptured intracranial aneurysms in 38, in 9, the bleeding was due to ruptured hypoplastic cerebral arteries, usually associated with status lymphaticus. The cause of the bleeding was not determined in 5 cases, 1 arteriosclerotic aneurysm and 1 arteriosclerotic vessel had ruptured.

The author goes on to discuss all the accepted views on intracranial aneurysm, as well as the pathogenesis. An account of the symptoms and signs is offered from the writings of others. It is pointed out that only in exceptional cases can the diagnosis be made before rupture. Occasionally, roentgen rays may be of assistance in the diagnosis, either because of a calcified vessel wall or by the use of arteriography.

The Medical Examiner is of the opinion that recovery in cases of subarachnoid hemorrhage is not due to intracranial aneurysm. He believes also that trauma is not a causal agent of congenital aneurysm. In the cases of 21 patients death occurred very suddenly, in the cases of 33 death did not occur until after one hour, in 6 cases death occurred in six days, and in 2 cases after the attack.

ADRIEN VERBRUGHEN, M D

Sjoeqvist, O Studies on Pain Conduction in the Trigeminal Nerve. A Contribution to the Surgical Treatment of Facial Pain *Acta physiol et neurol*, 1938, Supp 17

This extremely thorough work is divided into the following subjects: the morphological and physiological peculiarities of the nerves conducting the different qualities of sensation, analysis of the fibers of the trigeminal root, analysis of the fibers and studies of the degeneration in the trigeminal nucleus, pain conduction in the face, a new method of operative treatment of trigeminal neuralgia, and division of the bulbospinal tract.

Operative treatment of trigeminal neuralgia culminates today in the question of the possibility of doing away with pain and at the same time leaving intact the sensation of touch. Krause's ablation of

the ganglion and Spiller and Frazier's temporal division of the root produce anesthesia of all sensation qualities. Dandy asserts that tactile sensation is preserved by intradural operation by the posterior route, with division of the nerve root where it leaves the pons, since at this point there is already a morphological differentiation of the different qualities. Others, and among them the author of the present work, deny this. According to Dandy, the pain fibers of the roots come together on the postero-inferior margin of the root near the pons. According to the author's researches, it appears that the separation takes place within the brain stem and cord, and that the bulbospinal tract (the so-called descending nucleus) contains only pain and temperature fibers. More recent researches in nervous physiology (Erlanger and Gasser, Adrian and Zottermann, and Haeggqvist) have demonstrated that the rapidity of conduction in nerve fibers varies according to the thickness of the fiber, and that the different qualities of sensation are likewise connected with definite degrees of thickness of the fiber. It is therefore possible to determine the different speeds of conduction electrically (with the electroneurograph), in the mixed nerve or in the spinal-cord root. The curve shows various peaks, according to which the fibers are divided into the following groups: A (α , β , γ), B and C with the speeds 80, 50, 30, 20-10, and 1.6-1.3 m per second. On the other hand it is known that nerve fibers of a diameter of from 15 to 10 microns conduct muscle sensation, from 12 to 8 microns, touch, from 5 to 4 microns, heat and cold, and 4 microns or less, pain. Whether groups B and C both conduct pain or C takes care of the sympathetic conduction is not yet clear. Questions as to the difference in thickness of the medullary sheath and as to the dichotomic branching of the nerve fibers are considered in this connection. The researches in fiber analysis require a special technique for preparation of the sections and for staining, and in taking into account the sources of error exact mathematical formulas are used. Macroscopic examination of the trigeminal root shows that a distinct plexus triangularis (Krause) is constantly present, and much mingling and crossing of the fibers. The number of fibers in the trigeminal root is estimated at 140,000. Some very good views of cross sections of the fibers show that there is no important difference between the different segments of the root from the ganglion to the pons and that thick and thin fibers are everywhere intermixed. Exact reckonings have determined that the fibers under 4 microns in diameter (pain and temperature fibers) in the upper part of the root are most numerous throughout the entire length. This renders improbable the theory of an embryonic rotation of higher grade in the trigeminal root. Nowhere was there found any clear-cut demarcation between

fibers of different thicknesses which would justify the idea of the possibility of a dissociated anesthesia by partial division of the root. No such differentiation could be made out even close to the site of entrance into the pons (conus glialis).

Examination of the bulbospinal tract revealed a different picture. First the author emphasizes the difficulty and confusion of the anatomical nomenclature and describes with exactitude the anatomical location of the tract. The fiber analysis was made on monkeys' brains. It was found that the great majority of the fibers of the tract have a diameter of less than 4 microns and that the much thicker fibers of tactile sensation are present only in the upper portion and there but scantily and disappear completely as they descend. Photomicrographs of a human tract give the impression that the tract is also composed of thin fibers but it is more difficult to carry out Haeggqvist's fiber analysis in a strictly mathematical manner. Studies of the brains of patients on whom root division had previously been done by Olivecrona gave the following evidence of degeneration in the trigeminal tract: the portion of the root which is sectioned by Dandy's operation corresponds to the upper (dorsal) portion of the trigeminal tract. Here are found maxillomandibular fibers. The diameter of the tract is about 2 mm at the level of the superior olive and 1.5 mm at the level of the decussation of the pyramids; it therefore decreases relatively little but the bundles lie further apart in the upper portion and tend to fuse in the lower portion. In discussing pain conduction in the face the author refers to Wallenberg's syndrome: dissociated paralysis resulting from occlusion of the posterior inferior cerebellar artery. This too shows that the temperature and pain fibers are to be found in the bulbospinal tract of the same side while the quintothalamic tract which is affected in syringomyelia contains tactile fibers.

After these fundamental investigations and discussions the author describes his method of division of the bulbospinal tract: a method analogous to chordotomy. The operation is carried out under local anesthesia with morphine and lumbar combined with evipan general anesthesia for the operation on the intradural portion of the nerve fibers. The exposure is the same as for operation on the cerebellum. After elevation of the tonsils and the restiform body the roof of the fourth ventricle is opened. The incision lies caudal to the last roots of the vagus and at a level between the middle and lower thirds of the eminentia olivaris. The incision is from 3 to 4 mm long and from 3 to 3.5 mm deep. The most important of the possible complications of the operation is accidental injury to the root of the vagus (paralysis of the recurrent nerve). Very interesting is the appearance of herpes zoster of nuclear origin after the operation.

To date the operation has been performed in 9 cases. In spite of the theoretically good basis for this operation the impression given by these 9 cases is not convincing and one does not get the feeling

that the results are proportionate to the magnitude and boldness of the intervention. It must however be borne in mind that the cases were not very favorable ones and that the observation time has been too short. In 4 cases there was atypical neuralgia in 1 case herpes neuralgia and in another neuralgia secondary to aneurysm. In 3 cases the root had been resected or clamped off previously without success. In another 3 cases the result of the tractotomy was entirely negative and in the remaining cases improvement or freedom from pain followed the operation but the observation time has still been short. The analgesia obtained was total in some cases and partial in others. In 1 case the analgesia extended to the neck and 1 patient complained of numbness of the lower extremities. Secondary phenomena were herpes paralysis of the recurrent nerve in 4 cases and occasionally postoperative headache. It remains therefore for the future to show whether the new operation worked out by the author justifies itself in any case this study has very real value for our knowledge of trigeminal neuralgia.

(T. HABETEL) FLORENCE A. CARPENTER

SPINAL CORD AND ITS COVERINGS

Schajowicz F. The Microscopic Structure and Pathology of the Intervertebral Discs in the Young. (Contributo alla struttura microscopica e alla patologia dei dischi intervertebrali nei giovani.) *Chi d'oro* 33ms di m. 1ento 1038 24 5

Vertebral growth occurs at the junction of the osseous diaphysis with the cartilaginous epiphysis. This area is called the zone of proliferation. In this zone are found the so called islands of ossification (Fig. 1) which should be considered as specific to the zone of proliferation of the vertebrae. Microscopically these islands of ossification are seen as structureless masses staining a deep blue color with hematoxylin-eosin, studded here and there with reddish scars and lying in parallel fissures. These fissures may be filled with a light blue liquid or may show a bright red fibrinoid investment. The islands of ossification do not present an obstacle to the ossification of the zone of proliferation. Their function is probably to fix the zone of proliferation and to render it more resistant. They first appear towards the fifth year.

The intervertebral disc consists of the nucleus pulposus, annulus fibrosus and the cartilaginous plate adherent to the vertebra. The function of the cartilaginous plate is to resist the pressure of the nucleus pulposus and to transmit it elastically to the vertebral bodies. It reflects itself around the margin of the vertebral body, extending a short way along the anterior border of the body and ending by slightly re-entering the body in a step like formation. This step like formation is first seen at the third year by the fifth year it is clearly visible and toward the ninth year it begins from the side of the vertebral body. This formation is sometimes seen in individual from fifteen to eighteen

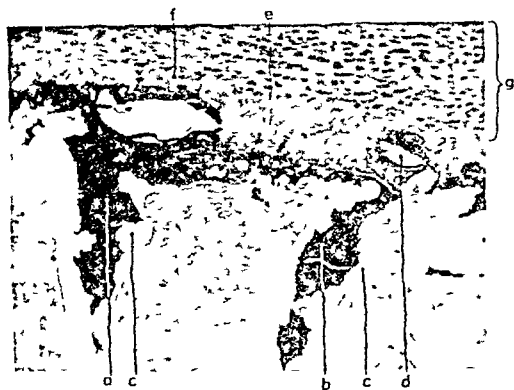


Fig 1 (a and b) Two islands of ossification which penetrate deeply into the spongiosa of the diaphysis (c), (d) mucus-like fluid in one of the fissures of an island of ossification, (e) zone of proliferation, (f) nidus of calcification above an island of ossification, (g) cartilaginous plate

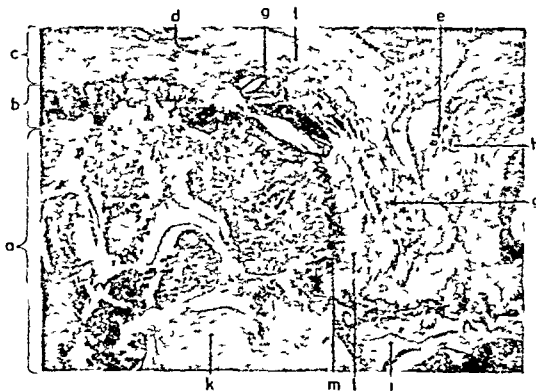


Fig 2 Cartilaginous nodule in an eighteen-year-old, (a) vertebral body, (b) zone of proliferation, (c) cartilaginous plate, which at (d) shows foci of degeneration, and at the superior margin of the cartilaginous nodule (e) is thinned and terminates in (f), folding itself towards the medulla. Island of ossification (g) at the superior margin of the cartilaginous nodule. The prolapsed nucleus pulposus contains numerous calcareous chips (g, i), and foci of degeneration (h), horizontal tract of sclerosed spongiosa (i) which intercepts the prolapse. The cartilaginous nodule shows at right and left a zone of cartilaginous proliferation (l) and a zone preparatory to calcification at (m)

years of age. The epiphysis calcifies in a disc-like manner. The calcium is deposited irregularly, at first in the posterior margin of the vertebra, and later in the anterior margin. Calcification of the epiphysis begins at the fifth year, and by the twelfth year it is about complete. From the thirteenth to the fourteenth year marginal ossification of the calcified epiphysis begins. Due to this marginal ossification the osseous epiphysis is developed as a ring and not a disc. Contrary to calcification, ossification of the epiphysis begins at the anterior end of the vertebral body. By the twentieth year osseous fusion between the diaphysis and epiphysis begins, and is completed by the twenty-fourth or twenty-fifth year.

The vertebral epiphysis is supplied by six vessels: two dorsal, two ventral, and two lateral. Involution of these vessels may give rise to areas of degeneration through which the nucleus pulposus may herniate. Besides this, areas of degeneration are often found toward the central part of the epiphysis where the pressure from the nucleus pulposus is greatest. The prolapsed tissue has in its upper part the same structure, and shows the same degenerative changes as the nucleus pulposus from which it is derived. Besides, there is regularly found a greater or lesser number of calcareous chips, taking a light blue color, which are derived from the zone of proliferation, which at one time was found at this place. These calcareous chips are absolutely characteristic of hernia of the intervertebral disc in young individuals. The prolapsed intervertebral disc, which is seen as a cartilaginous nodule (Fig 2), causes sclerotic and reactive changes in the vertebral diaphysis. Exactly in front of a prolapse, ossification may advance more than any other place. This may give rise to convex reliefs directed toward the prolapse. These convex reliefs are often seen on roentgenograms (Fig 3), even though the cartilaginous nodules are not. DIMITRIADIS, M.D.

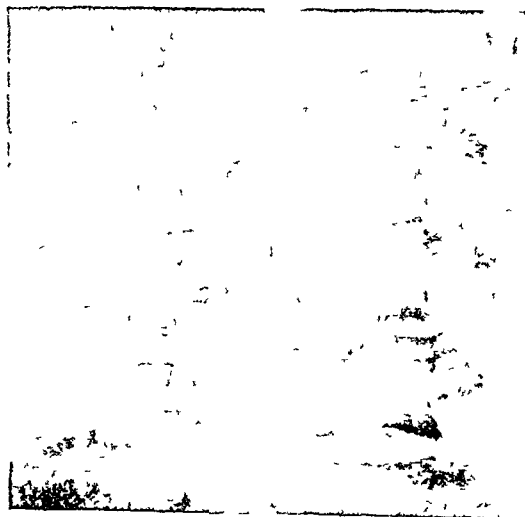


Fig 3 Lateral radiogram of the first to the fifth lumbar vertebrae of an eighteen-year-old patient. The intervertebral space between the second and third lumbar vertebrae is diminished. The top of the third vertebra shows a large cartilaginous nodule, which reaches the anterior end of the vertebra, digs deeply into the spongiosa, and has a thick, sclerotic margin. A smaller cartilaginous nodule may be seen at the lower margin of the same vertebra, near its anterior end. The upper margin of the fourth vertebra shows a convex relief directed toward the intervertebral disc.

Fay T The Localization and Treatment of Lesions of the Spinal Cord *Surg Clin North Am* 1938 18 1577

In the majority of cases of lesions of the spinal cord pain is the one common symptom that is familiar to both the patient and the clinician. It is the most primitive sensory mechanism of the nervous system and maintains the early segmental pattern of the nervous system. The superficial plan of the pain fiber network still maintains its segmental pattern and when extended to the skin surface is referred to as a dermatome. The dermatomes extend from the oral to the anal end of the body. Pain contrasts with the sensations for heat and cold and with the tactile discriminatory sense in that the latter extend from a half to a full dermatome on each side of their own segment with consequent decrease in reliability from the standpoint of localization. Because the vascular system arises early it carries with it those elements of the nervous system which are first associated with the cardiovascular apparatus namely fibers from the thoracic cord. This origin explains the characteristic projections of pain in the case of vascular diseases.

The clinician can in a few minutes with an ordinary pin and a test tube filled with ice water determine whether the areas of the body at and below the level complained of by the patient retain their full appreciation for these sensations. Hyperalgesia and an increased recognition of cold are signs of spinal root irritation. A comparison of pain and cold appreciation in the two lower extremities as well as a comparison between this portion of the body and the face should clinically establish whether or not the spinal pathways are intact. The patient should be co-operative and fully exposed for an examination.

Pinpoint or a cold tube should be drawn rapidly over the surfaces of the body from the region of the buttocks to the heel on the inner aspect of the leg to the groin then to the axilla and following a course along the inner aspect of the upper extremity to the little finger then from the base of the thumb

to the shoulder cap and finally over the neck and onto the face. In this way every segment of the body will be examined in its proper sequence.

Characteristic responses to drawing a pin over the surface of the body in an early case of spinal cord tumor will be as follows:

- 1 The patient will readily recognize the pinpoint as pain but when the normal area is reached the increased sensitivity will be noted as more painful.

- 2 At the root level of the tremor an area of hypersensitivity will be encountered which should be well mapped out.

- 3 Painful stimulation through counter irritation yields vasomotor flushing. The scratch of a pin may give rise to a wheal along its course that will clearly pick out the root segments involved. Light reflected off the skin may give a dusky pigmented and slightly sunburned appearance.

- 4 Percussion of the spinous processes usually yields pain over the site of the lesion.

- 5 Pressure of the thumb downward and laterally over the spinous processes usually yields marked discomfort at the site of the lesion.

An additional aid is the myelogram which is obtained by the withdrawal of some spinal fluid, the introduction of a small amount (20 c.c.) of air or oxygen and the use of stereoscopic x-rays. The myelogram will frequently demonstrate defects due to various types of lesions. This procedure has many advantages over that in which lipiodol is used as this substance is not absorbed and may be a source of severe irritation. In the author's clinic myelograms have been taken in 130 cases with very gratifying results.

The operative care of patients with cord tumor requires special attention to the matter of shock and to the care of the bladder. At operation the wound is carefully irrigated to remove the by-products of trauma which are believed to be responsible for shock. Hexamethylenamine is used routinely for the bladder and in severe cord lesions suprapubic cystostomy is recommended.

JOHN WILTSE, LEPROV, M.D.

CHRONIC CYSTIC MASTITIS AND CARCINOMA

Collective Review

DAVID H PATEY, M S, London, England

INTRODUCTION

THE problem of the relation of chronic cystic mastitis to carcinoma is of immense practical and theoretical importance in the surgery of the breast, as on it hangs the possibility of prophylactic treatment of the potentially carcinomatous breast. The recent literature contains many good reviews, among which may be specially mentioned those of Campbell (9), Goldzieher and Kaldor (23), Harvey (27), and Semb (48).

Campbell divides the history of the condition into three periods.

1 An early period, belonging chiefly to the middle of the nineteenth century, in which the views of surgeons on cystic disease of the breast depended almost entirely on clinical experience. During this period, with which are associated such names as Paget, Brodie, Birkett, Gross, and Velpeau, the disease was regarded generally as benign in nature and significance.

2 A period beginning toward the end of the nineteenth century and continuing into the present century, during which more attention was paid to microscopical appearances. On account of the frequency with which epithelial hyperplasia was noted, cystic disease of the breast came to be more suspected, and as a result amputation of the breast as a prophylaxis against carcinoma became more common. The names of Reclus and Schimmelbusch belong to the early days of this period.

3 A period extending up to modern times, characterized by a conflict between these two points of view and associated conflicting views on the etiology and treatment of the disease.

EXPERIMENTAL EVIDENCE

The literature of the last ten years or so, with which the present review is chiefly concerned, falls principally under the last heading. The same years, however, have also seen the emergence of evidence of a completely new kind, the result of the great advances that have taken place in our knowledge of the hormones. We seem now to be entering upon a distinct new phase in breast pathology, the principal feature

of which will be the correlation of the facts elicited by hormonal experiments in animals with those of clinical experience. Therefore, the first subject calling for review is the experimental evidence bearing on the relation of cystic mastitis to carcinoma.

Nelson (46) has summarized our knowledge of the normal endocrine control of the mammary gland. While there are differences in different species, in most animals estrin controls the duct systems of the breast, and the corpus-luteum hormone the acinar systems. The hormone from the anterior lobe of the pituitary gland acts on the breast indirectly through the gonadotropic hormones and the gonads, and directly through its lactogenic hormone. Passing from physiology to pathology, the most clear-cut pathological pictures have been produced by estrin. It has been shown that the continued administration of large doses of estrin gives rise in many species of animals to marked proliferation of the duct systems of the breast, dilatation of the ducts with secretion, cyst formation, epithelial proliferation, and proliferation of inflammatory cells. These changes seem to be most easily produced in the mouse and the rat. They have been produced in the mouse by Goormaghtigh and Amerlinck (24), Lacassagne (33, 34), Loeb and his collaborators (39, 49), Bonser and his collaborators (5, 6), and Burrows (8), while Gardner and his collaborators (18, 19) showed a similar spontaneous condition in the breasts of a mouse associated with and, he believed, caused by, bilateral granulosa-cell tumors of the ovaries. In the rat similar changes in the breast from estrin injections have been produced by Ashwood and Geschickter (2), and Herold and Effkemann (28). Similar changes of a lesser degree have been produced in monkeys by Geschickter and Lewis (20, 22), and in rabbits by MacDonald (40), though Fifer (16), states that a lesion resembling chronic cystic mastitis is common at certain periods of the sexual history of this animal. Apart from cystic disease it has been shown by Lacassagne, in experiments that are now classical, that in the mouse the continued administration of estrin may lead to the development of carcinoma of the

breast Lacassagne showed that the facility with which cancer of the breast was produced in mice with estrin depended on the degree of hereditary susceptibility to cancer of the strain of mouse used Lacassagne's work has been fully confirmed by Bonser (5 6) Burrows (8) Cramer and Horning (13) Gardner et al (18 19) and Loeb et al (39 49)

The evidence is thus clear that diffuse cystic disease of the breast can be produced in many animals by the administration of estrin and that in the mouse continued administration of the estrin may lead to carcinoma of the breast and many workers have not hesitated to regard the condition as comparable with cystic mastitis in the human being and to refer to the experimental work as proof of the precarcinomatous nature of chronic cystic mastitis Thus Goor maghtigh and Amerlinck (24) have as the title of their paper *Realisation experimentale de la maladie de Reclus de la mamelle chez la souris* and Cheatele (11) states that the microscopical changes in the breasts of Lacassagne's mice are the same in sequence and in kind as those met with in human cystic disease which he had always held to be a precarcinomatous condition Some writers on the other hand sound a note of caution Taylor (50 51) points out that many difficulties remain to be overcome before human cystic disease of the breast and carcinoma can be explained on a hormonal basis He argues that there is no special history of uterine disturbances in these cases such as would be expected from excess estrin action that there is no evidence of excess of estrin in the blood or urine and that the age at which these conditions occur is usually at a time when ovarian activity is approaching or has passed the climacteric Experimental work does however supply some possible lines of reply to these objections Lathrop and Loeb (35) showed as long ago as 1916 that whereas castration of female mice below the age of six months usually prevents the subsequent spontaneous development of carcinoma of the breast after this age this procedure was without effect In other words the pathological condition may develop long after an exciting factor has ceased to act and more recently Geschickter (21) in 1934 reported a case in which large amounts of estrin were found in a fibro-adenoma of the breast thus raising the possibility of the breast tissue concentrating the hormone

The present experimental evidence can therefore be summarized as follows—

1 Cystic disease of the breast closely resembling cystic disease of the human breast can be

produced in a variety of animals but in particular in the mouse and the rat by the continued administration of large amounts of estrin

2 In mice of a strain susceptible to cancer such cystic disease may lead on to carcinoma of the breast

3 Cystic disease is not necessarily followed by carcinoma of the breast since it does not occur in the rat nor in mice of a cancer refractory strain (Evidence has recently been brought forward by McEuen (4) that very exceptionally carcinoma may be produced in the breasts of rats)

The evidence thus shows that cystic disease of the breast may be a precarcinomatous condition in animals but this does not answer the question whether it is so and if so to what extent in man The problem for man might be restated in the form of the question *Is man comparable in this respect to the mouse or the rat?* The answer to such a question can be given only after observation and experiments on man

HISTOLOGICAL EVIDENCE

The evidence in man may be histological clinical or a combination of the two clinico-histological The purely histological evidence is of two types

1 The evidence of the changes of chronic cystic mastitis in breasts removed for developed carcinoma

The evidence of unsuspected carcinomatous changes in breasts removed for chronic cystic mastitis

However both carcinoma of the breast and chronic cystic mastitis are not uncommon conditions so that the possibility of their coincidental occurrence has always to be considered Histological evidence therefore to be of real value requires control by means of observations on the normal microhistology of the breast and on the incidence of unsuspected chronic cystic mastitis in the general body of the population Unfortunately on neither of these two points does stability exist It is difficult to say what is the normal histology of the breast Dawson (14) who made a special study of the normal breast referred to the differences in structure in different individuals and these have also been pointed out by other writers In addition there are variations according to age and the phase of sexual life It has even been suggested that there are considerable differences in the same breast at different phases of the menstrual cycle and a considerable literature has grown up on this point [see Rosenberg (47) Lewis (36) Taylor (50 51) and Ingleby

(29)] Again, probably arising out of the difficulty of determining the normal range of microscopical changes in the breast, the reported incidence of chronic cystic mastitis as determined by routine examination of post-mortem subjects varies with different writers. Thus McFarland (43) found it in 15.33 per cent of his cases, Keynes (31) in approximately 50 per cent, and Borchardt and Jaffé (7) in 93 per cent.

The most complete work on the subject of the pathological histology of the breast is that of Cheatele (12), and the monograph is already a classic. Their answer to the question is definite. They affirm that, "about 20% of all carcinomata of the breast can be definitely stated to begin within the lesions of the cystiphorous state." They also affirm that, while the calculation of the proportion of cases of cystic mastitis that become carcinomatous is much more difficult, the whole sequence of changes from desquamative epithelial hyperplasia, through cyst formation, up to benign neoplasia, and finally carcinoma may be traced histologically. They estimate that the postulated sequence of changes from cystiphorous hyperplasia to a carcinoma occupies about thirty years. They further state that carcinoma unsuspected clinically was found in 3 of 4 cases of chronic cystic mastitis treated by amputation, though they admit that this is an abnormally high proportion. On the other hand, as illustrating the variability of the evidence on this same point, Bloodgood (3) states that of 222 cases, in which the whole breast was removed for chronic cystic mastitis, not a single case presented gross or microscopical evidence of cancer. Charteris (10) examined microscopically and in detail 48 breasts removed for carcinoma. In all except 7 cases, chronic mastitis in some degree was present in some part of the breast. He also examined 32 unselected breasts from post-mortem subjects, and found similar changes of chronic cystic mastitis in only 5. From this he concludes that the chronic mastitic changes in the carcinomatous breast were related to the carcinoma and precursory to it. Fraser (17) noted similar epithelial changes in cancer of the breast to those described by Charteris, but, because these changes were particularly marked in centrifugal fashion around the carcinoma, he considered them to be secondary to the carcinoma and not precursory. Semb (48) found cystic mastitis in 77 per cent of 122 cases of carcinoma mammae. He found similar changes in only 1 of 32 routine post-mortem cases, and from this he concluded that the chronic cystic mastitis and the carcinoma stood in some relation to each other. Morpurgo

(45) found cystic changes present in 24 per cent of 196 carcinomas of the breast but gives no control figures, while, finally, Handley (25) developed in histological detail his argument that chronic mastitis is a precarcinomatous condition, both mastitis and carcinoma having a common pathology in lymphatic obstruction. There is general agreement among all writers, even those who hold strong views on the precarcinomatous nature of chronic cystic mastitis, that carcinoma developing actually in the wall of a large cyst is exceptional.

To conclude the histological evidence reference may here be made to a suggestion which occasionally appears both in the experimental and the clinical literature that the secretory and epithelial proliferative phases of chronic cystic mastitis are antagonistic, the former being benign and leading only to cyst formation, the latter possibly dangerous. While this suggestion is supported by some evidence, most cases of chronic cystic mastitis would appear to show both processes simultaneously, but in varying degrees.

CLINICAL EVIDENCE

Most of the purely histological evidence, therefore, suggests a relationship between chronic mastitis and carcinoma. Apart from the difficulties previously mentioned, however, the weakness of purely histological evidence lies in the difficulty of definite determination from its morphology of the biological potentialities of an epithelial cell. Eberts (15) an enthusiastic follower of Cheatele, goes so far as to state that "the diagnosis of cancer can now be made without histological evidence of infiltration." It is the supreme contribution of Bloodgood (4) to breast pathology that he has shown that this statement is untrue, having described cases presenting what histologists diagnosed as dangerous epithelial proliferation of the breast which were watched up to thirty years but did not develop carcinoma. The point has been well put by Johnson (30), who after paying tribute to the contributions of morbid anatomy to the pathology of the breast, stated that "on the other hand it is necessary to study without bias purely clinical evidence." The period reviewed in this article presents some interesting clinical material. However, just as the histologist starts with the difficulty of determining the border between normal variations and pathology in the breast, so the clinician has his difficulty in determining clinically the diagnosis of chronic cystic mastitis. On the one hand, well marked cystic changes and epithelial hyperplasia may be present histologically without any cor-

responding clinical abnormality in the breast. On the other hand by no means all breasts that are painful and nodular show histologically chronic cystic mastitis. As Cheate and Cutler (12) have pointed out increased nodularity of the breast may be caused by atrophy or alterations in consistency of the supporting fat alterations in the supporting fibrous tissue, and vascular changes at the menstrual period while functional pain in the breast is not uncommon. Therefore in most cases clinical examination is no guide to the presence or absence of epithelial proliferative changes in the breast. (The two conditions which are exceptions to this statement are Paget's ulceration of the nipple and bleeding from the nipple either of which symptoms is a clear indication of some type of epithelial hyperplasia in the breast.) The only really satisfactory cases of chronic cystic mastitis for follow up therefore are either those in which the cysts are so large that their presence is demonstrable clinically or those in which a diagnostic exploration has shown the presence of the changes histologically. Johnson (30) followed up for from one to twenty years and found no evidence of carcinoma in 61 of 107 cases of cyst of the breast which he had treated by local resection in 2 other cases carcinoma had developed in the opposite breast and in still 2 other cases in the breast of the same side. Bloodgood (4) followed up for periods up to thirty years more than 100 patients from whom blue-domed cysts had been removed from one breast and of whom none had developed cancer. In a previous communication (3) he had referred to the follow up of 128 cases of chronic cystic mastitis treated by local removal in which cancer developed in 3 (approximately 2 per cent) which percentage he states is the same as for normal breasts. (This figure of 2 per cent incidence of cancer in normal breasts is quoted by many authors and Bloodgood appears to be its originator. In the period under review however none of the authors who use this figure indicates how it was obtained. In any case there is the difficulty that a breast that appears normal clinically may show marked epithelial hyperplasia histologically. The bald statement that there is a 2 per cent incidence of carcinoma in normal breasts without reference to the criteria of normality or the length of time the individuals have been followed up is almost valueless.) Mathews (41) states that during twenty years he aspirated fully 50 cysts and that only 1 patient has developed cancer. Adair (1) in discussing Mathews paper also stated that carcinoma occurs after operations on blue domed cysts in

less than 2 per cent of the cases. Campbell (9) refers to 233 cases of chronic cystic mastitis treated by local excision of areas of breast tissue and followed up for from two to fourteen years. In 1 patient only did carcinoma of the breast develop. Eighteen per cent of the 233 patients had lesions in which epithelial hyperplasia was marked histologically yet in none of these did carcinoma develop. Klingenstein (32) followed up for from two to eleven years 54 patients who underwent partial breast excision for chronic mastitis of whom 2 developed carcinoma. Lewis and Geschickter (37) and Geschickter (20) report the follow up of a large number of similar cases in which the incidence of carcinoma was less than 2 per cent. Moritz Borchardt (44) brings forward an argument used by many surgeons in stating that he has treated with success so many cases of cyst of the breast by simple puncture that he cannot believe that they are related to carcinoma. A different picture is painted by Liedberg (38) who followed up for from five to ten years 40 patients who had had local excision of the breast for cystic disease. 28 of these were classified as having simple cystic disease and 3 of them developed carcinoma. 10 were classified as having cystic disease associated with epithelial hyperplasia (including duct papilloma) and 3 of these developed carcinoma of the breast. The high incidence presented by Liedberg contrasts strikingly with the low incidence reported by the great majority of the authors.

Summing up the clinical evidence one may say that on the whole it points strongly in the direction that if clinically diagnosable cystic disease of the breast is a precarcinomatous condition in actual practice the danger of carcinoma is so slight that even after many years carcinoma develops only in a small proportion of cases. In other words if carcinoma is a danger in these cases it is a danger which only rarely materializes in the human being.

SUMMARY AND CONCLUSIONS

If one tries to sum up the rather conflicting evidence one may say that the purely histological evidence and the experimental evidence both point to a relationship between chronic cystic mastitis and carcinoma. The production of cystic disease of the breast in mice by means of estrin from which carcinoma may develop under suitable conditions is conclusive for some relationship at any rate. On the other hand the clinical and clinicohistological evidence brings out two points (1) in the vast majority of cases it is impossible to recognize clinically the precarcino-

matous change for the simple reason that the histological abnormality may be associated with no clinical abnormality; and (2) the risk of carcinoma in cystic disease of the breast which is clinically diagnosable is slight. That the risk is only as slight as in a normal breast is asserted but not proved. From the practical point of view, therefore, one may conclude in dealing with clinically diagnosable cystic disease of the breast that while from a qualitative standpoint the theoretical possibility of the development of carcinoma must be admitted, from the quantitative point of view this possibility is not strong enough to justify the routine employment of such radical measures as amputation of the breast. Such a procedure might be indicated under special circumstances, as when there is a family history of carcinoma of the breast, but for most cases less radical measures combined with watching would appear to be the best course. Whether in the future it will be possible to prevent the development of carcinoma of the breast by interruption of the sequence of events in the precarcinomatous phase by some hormone or some physical agent such as the x-rays is a matter for speculation. On the present position of x-rays in this connection, Handley (26) concludes that 'chronic mastitis is often amenable to deep x-ray treatment,' but that 'the protection afforded by x-rays is neither absolute nor permanent.'

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responding clinical abnormality in the breast. On the other hand by no means all breasts that are painful and nodular show histologically chronic cystic mastitis. As Cheate and Cutler (12) have pointed out increased nodularity of the breast may be caused by atrophy or alterations in consistency of the supporting fat, alterations in the supporting fibrous tissue, and vascular changes at the menstrual period, while functional pain in the breast is not uncommon. Therefore in most cases, clinical examination is no guide to the presence or absence of epithelial proliferative changes in the breast. (The two conditions which are exceptions to this statement are Paget's ulceration of the nipple and bleeding from the nipple, either of which symptoms is a clear indication of some type of epithelial hyperplasia in the breast.) The only really satisfactory cases of chronic cystic mastitis for follow up, therefore, are either those in which the cysts are so large that their presence is demonstrable clinically, or those in which a diagnostic exploration has shown the presence of the changes histologically. Johnson (30) followed up for from one to twenty years and found no evidence of carcinoma in 61 of 107 cases of cyst of the breast which he had treated by local resection; in 2 other cases carcinoma had developed in the opposite breast and in still 2 other cases in the breast of the same side. Bloodgood (4) followed up for periods up to thirty years more than 100 patients from whom blue-domed cysts had been removed from one breast and of whom none had developed cancer. In a previous communication (1) he had referred to the follow up of 18 cases of chronic cystic mastitis treated by local removal in which cancer developed in 3 (approximately 2 per cent) which percentage he states is the same as for normal breasts. (This figure of 2 per cent incidence of cancer in normal breasts is quoted by many authors and Bloodgood appears to be its originator. In the period under review however none of the authors who use this figure indicates how it was obtained. In any case there is the difficulty that a breast that appears normal clinically may show marked epithelial hyperplasia histologically. The bald statement that there is a 2 per cent incidence of carcinoma in normal breasts without reference to the criteria of normality or the length of time the individuals have been followed up is almost valueless.) Mathews (41) states that during twenty years he aspirated fully 50 cysts and that only 1 patient has developed cancer. Adair (1) in discussing Mathews' paper also stated that carcinoma occurs after operations on blue-domed cysts in

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If one tries to sum up the rather conflicting evidence one may say that the purely histological evidence and the experimental evidence both point to a relationship between chronic cystic mastitis and carcinoma. The production of cystic disease of the breast in mice by means of estrin from which carcinoma may develop under suitable conditions is conclusive for one relationship at any rate. On the other hand the clinical and clinicohistological evidence brings out two points: (1) in the vast majority of cases it is impossible to recognize clinically the precarcino-

these cases poor results are due to insufficient collapse of the lung, in others, the collapse is sufficient while the pneumothorax is obtained, but when no more air is insufflated, the residual extrapleural cavity may fill with exudate requiring repeated punctures, in 2 cases the exudate became infected. If good results are obtained after discontinuance of the pneumothorax, the extrapleural cavity is obliterated, in such cases, the pulmonary cavities disappear, and the lesion in the opposite lung may heal to such an extent that the patient becomes free from symptoms.

Extrapleural pneumothorax is more definitely indicated and gives better results in cases with recently formed cavities, which have appeared during the active stage of the disease, and in which thoracoplasty is contraindicated. These lesions are usually in the upper lobe of the lung, and can be adequately collapsed by extrapleural pneumothorax, without complications or harmful effect on the opposite lung. The principles of the treatment are the same as those of the "classical" method of pneumothorax, but a positive pressure must always be maintained. The collapse of the lung with extrapleural pneumothorax is limited to the site of the cavity and immediately surrounding area. According to the site of the cavity, either the paravertebral, the anterior, or the axillary route may be used for insufflation, all have given good results.

ALICE M. MEYERS

Jorge, J., and Goni Moreno, I. **Bronchogenetic Secondary Hydatidosis** (*Hydatidosis secundaria broncogenetica*). *Rev de ciruj de Buenos Aires*, 1939, p 1

The short number of observations published explains the classic conception of the healing of hydatid cyst of the lungs, after the cyst has ruptured and the patient expectorated the contents. Devé, the first to study this type of echinococcosis, suggested the possibility of bronchiogenic infection. The authors believe that hitherto only 16 or 17 cases of this condition have appeared in the medical literature. Almost all were found in Argentina.

The authors believe that the pulmonary cysts must be treated as soon as possible. The old idea that the cysts of the hilum require expectant treatment until the rupture and vomiting occurs must be changed, the expectant treatment should continue only until the natural growth makes surgical procedure easier.

The authors prefer the two-stage operation, having had the best results with it. It is necessary to wait until the cyst comes near the thoracic wall and in close contact with it. The cysts which develop near the hilum or toward the mediastinal face of the lung very often fail to fulfill this condition.

For this reason the authors believe that the last word on the treatment of the central cysts has not been pronounced and that very often, while one waits for their growth, one comes closer to the dangerous period of rupture. They cannot say which eventuality is more dangerous for the patient.

either rupture with the possibility of healing, or difficult approach with the possibility of disaster.

The ignorance, for so many years, of this clinical condition and the few certain observations compared with the large number of ruptures in patients with pulmonary cysts convey the impression that the danger of bronchial dissemination is minimal. Nevertheless, Devé believes that it is more common than one thinks. Many cases have been cured by progressive elimination of the cysts, and their existence has not been noticed. For this reason it is important to respect, if possible, the central cysts, as long as they do not bring hemoptysis, and to perform the operation as soon as their growth brings them within reach.

Devé has shown experimentally how the bronchial flooding with the contents of a living cyst is followed by inflammatory lesions which disappear in ten days and leave a number of little parenchymal nodes called "hydatid granules of Devé." Some nodes are eliminated, or degenerate, but some, after four and one-half months, become parabronchial, central, subpleural, or cortical lesions with the aspect of hydatid vesicles. These are eliminated by a number of small ruptures, which explain the scarceness of the bronchogenic echinococcosis after the rupture of the primitive cyst.

The authors describe a case which is, for Devé, the most convincing case observed in man. The patient was a young man in good health who had a hydatid cyst which ruptured and caused prolonged vomiting. Two years after this, having been cured, according to clinical and roentgenological findings, he was examined by means of the x-rays and many nodular, round shadows of different sizes, with the appearance of grapes, were observed in both lungs. There were no clinical manifestations that could be correlated with the seriousness of these lesions. The patient complained of the elimination, by means of short spells of vomiting, of some newly formed cysts, with a temporary augmentation of mucopurulent expectoration.

For this reason it is important that all patients who have vomited a ruptured cyst be observed periodically. Whether they will develop bronchogenic echinococcosis depends upon their defenses. If they are young and the collapse of the parenchyma prevents the appearance of inflammatory symptoms, the results may be good. However, the cases of complete healing are very few. The rest of the patients die of hemoptysis, cachexia, or pneumonia.

Devé believes that to consider a patient definitely cured one must wait for two or three days after the vomiting. Those patients in whom the lesions appeared after from fifteen to twenty years were probably re-infected.

HECTOR MARINO, M.D.

Neuhof, H., and Touroff, A. S. W. **Acute Aerobic (Non-Putrid) Abscess of the Lung**. *Surgery*, 1938, 4: 728

The most serious pulmonary complication of necrosuppurative bronchopneumonia is aerobic

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Desaive P. A Comparative Study of 350 Benign and Malignant Tumors of the Mammary Gland (Étude comparée de 350 tumeurs bénignes et malignes de la glande mammaire) *Rev belge d sc méd* 1938 10 533

Desaive notes that a pure fibroma or a pure adenoma of the mammary gland is very exceptional as a rule epithelial hyperplasia and connective tissue proliferation are associated to form a fibro adenoma.

At the surgical clinic of the University of Liege there were 350 cases of tumor of the breast observed during the period from 1928 to 1935. Of these 53 were initially benign including 42 cases of fibro adenoma 9 cases of fibro adenoma undergoing transformation into epithelioma and 1 case each of pericanalicular fibro adenoma (Mouret) and intracanalicular fibro adenoma (Muller). There were 297 cases of initially malignant tumor of which 296 were glandular epitheliomas of various types and 1 was a melanotic sarcoma of the areola. Such a preponderance of malignant tumors is a general occurrence as shown by reports from other clinics.

In a study of this series of benign and malignant tumors of the mammary gland at Liège the author finds that the majority of patients with malignant tumors were between fifty and fifty nine years of age on admission to the clinic with fifty four years as the mean. The majority of patients with benign tumors were between forty and forty nine years of age with forty years as the mean. On the basis of the history of these cases the author finds that the mean age for the occurrence of benign tumors of the breast is thirty seven years and for malignant tumors fifty two years a difference of fifteen years.

Of the 350 tumors of the breast in this series only 6 occurred in males (4 adenocarcinomas 1 fibroma and 1 fibro adenoma). Of the 344 women patients 47 per cent of those with benign tumors and 45 per cent of those with malignant tumors had not borne children the menopause had occurred in 29.5 per cent of those with benign tumors and in 76.1 per cent of those with malignant tumors. These findings indicate that malignant tumors of the breast develop chiefly after the menopause at the time of the diminution of ovarian activity it is possible that the failure of the ovarian hormone results in excessive secretion of the hormone of the anterior pituitary lobe which may stimulate excessive cellular proliferation. Malignant tumor of the breast was associated with uterine fibroma and hyperplastic metritis in 20 cases and with ovarian cysts in 5 cases.

In cases both of benign and malignant tumors the left breast was somewhat more frequently involved than the right and the most common site of the tumor was the upper and outer quadrant of the breast. Transformation of a fibro adenoma of the

breast into an epithelioma is relatively rare as this was demonstrated in only 9 of the author's cases.

The fact that a transformation of fibro adenoma into epithelioma is rarely observed and that the benign tumors of the breast develop at a different age period and under different hormonal influences as compared with malignant tumors leads the author to conclude that benign fibro adenoma of the breast is not a precancerous lesion in the usual sense of the term. This does not however imply that surgery is not indicated in fibro adenoma of the breast. Because of the difficulty of making a correct diagnosis without biopsy and because of the possibility of malignant degeneration or at least of atypical evolution of fibro adenoma of the breast the author considers that operative removal of such tumors is the treatment of choice.

ALICE M. MEYERS

TRACHEA LUNGS AND PLEURA

Nissen R. Extrapleural Pneumothorax (Le p eu mothorax extra pleural) *Arch m d-ch de l appa respir* 1938 13 196

Tuffier in 1891 was the first to advocate extra pleural pneumolysis for detachment of the lung from the thoracic wall in cases with pleural adhesions. Twenty years later he used this same method for collapsing the lung in pulmonary tuberculosis. In 1913 Meyer perfected Tuffier's operation by including pneumothorax in the procedure as a routine he called this extrapleural pneumothorax.

In 1929 Nissen employed Meyer's procedure in the treatment of a case of tuberculosis of the apex of the lung in which he had planned to do an apicolysis combined with partial thoracoplasty by resection of the upper ribs. However the patient suffered a collapse when the apicolysis was completed and the thoracoplasty was not done but in order to maintain the apex of the lung in collapse the apical cavity was repeatedly filled with air as for pneumothorax therapy. The patient made a good recovery after the pneumothorax had been maintained for fourteen months.

Since that time the author has employed extra pleural pneumothorax on definite indications chiefly in cases in which the usual method of pneumothorax was impossible because of adhesions and thoracoplasty was contraindicated by the patient's poor general condition. Extrapleural pneumothorax was first used in the treatment of tertiary cavities but the method did not always give good results in this type of lesion. In 1 case the cavity perforated a few weeks after operation and 1 death resulted and in 2 cases there was hemorrhage with formation of a hematoma. The ultimate result was favorable in 1 of these 2 cases but in the other no demonstrable diminution of the cavity was obtained. In some of

is very much widened by means of a self-retaining retractor or rib spreader. Complete exposure of the hilus of the lung is obtained and resection of ribs is unnecessary.

In the first stage of the operation the mediastinal pleura is incised and dissected medialward toward the underlying areolar tissue, which exposes the pulmonary artery. This vessel is then carefully freed by blunt dissection and separated from the underlying bronchus. The interior surface is dissected away from the upper border of the superior pulmonary vein, and a silk ligature is passed around the mediastinal portion of the vessel at least from 2 to 3 cm proximal to its intrathoracic branches. Another ligature is placed about the vessel 5 cm distal to the primary ligature, each ligature is then separately tied in a square knot.

The ligatures are cut at least 6 cm long so that they may be immediately recognized at the second stage operation.

The phrenic nerve is crushed to allow temporary elevation of the diaphragm and obliteration of the thoracic cavity on that side. The primary bronchus is then stripped of all the bronchial lymphatic glands and peribronchial connective tissue and another ligature of braided white silk is placed about the bronchus high up near the trachea. This ligature is tied at the first stage. The pulmonary ligament is then divided and ligatures of double silk are loosely placed about the superior and inferior pulmonary veins, but they are not ligated at the first stage.

If this procedure is carefully followed the flow of blood through the pulmonary veins is not disturbed in any way and no moist gangrene of the lungs will result. The vagus nerve on that side is then crushed, and adhesions which may be present can be separated, but they are more safely dealt with in the second stage. The wound is then closed by drawing the ribs together, suturing the pectoral fascia with medium-sized silk sutures, and closing the skin with fine silk sutures.

The time interval elapsing between the first and second stages may be said to be about one week. Within reason it may be lengthened or shortened, but the final decision on this point remains to be determined by the future. This interval of rest between the first and second operation allows the patient to adjust his pulmonary and peripheral circulations to the changed intrathoracic conditions.

At the second stage the thoracic cavity is reopened through the incision made during the first operation. The loose ends of the ligature surrounding the pulmonary artery are located immediately and thus reveal the point of ligation of the artery. Following this the ligatures about the pulmonary vein are tied. The amputation of the hilus of the lung is then performed and no lung tissue, peribronchial tissue, nor lymph glands should be left behind. The bronchus is cut across in the mediastinum, not far from the bifurcation of the trachea and primary encircling ligature. The incision is made obliquely to the long axis of the bronchus, and in addition to that it is

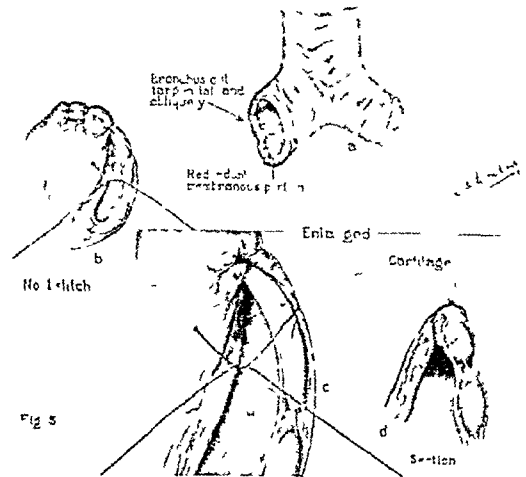


Fig 1 The method of closure of the bronchial stump after the preliminary circumferential ligature has been placed around the bronchus and the latter ligated.

made on a bias so that the posterior membranous portion is a trifle longer than the more anterior cartilaginous wall (Fig 1). Interrupted fine silk sutures are then placed and when they are tied and the knots pulled home, the relaxed and relatively tough membranous posterior wall is not only snugly applied or fitted to the inner surface of the semi-circular cartilaginous ring at all points, but also, as a result of the way in which the sutures have been placed, the membranous portion is rolled over the cartilaginous cut edge in a way corresponding to the inversion of the intestinal wall. The cut ends of the mucous membrane are thus approximated on the inside of the blind-end stump. This tends to flatten out the horseshoe-shaped bronchial cartilage rather than constrict it, and therefore puts no tension whatever upon the suture line. Two parallel rows of through-and-through mattress sutures are placed proximal to the afore-mentioned interrupted row. These consist of No 1 chromic catgut.

The closure of the wound after the second stage is then done in a similar manner in all respects to that following the first operation.

Following the second-stage operative procedure the inside of the thoracic cavity is completely lined with a surface of granulation tissue of considerable thickness. The decidedly shrunken cavity becomes filled with plasma, which in the absence of infection will clot and form a coagulum into which fibrous connective tissue grows from the surrounding wall of granulation tissue. After the second-stage operation this one continuous cavity will become transformed into a multilocular space comprised of walled-off pockets, the septa or walls of which are formed by the ingrowths of connective tissue. It is inadvisable to drain the thoracic cavity.

J DANIEL WILLEMS, M D

(non putrid) abscess of the lung. Necrosuppurative bronchopneumonia is characterized (1) pathologically by the coexistence of suppuration and necrosis involving one or more bronchopulmonary segments (2) clinically by the occurrence of fever and cough and the expectoration of odorless pus (3) roentgenologically by the presence of one or more areas of pneumonic infiltration and (4) bacteriologically by the presence of aerobic pus producing bacteria in the sputum.

The stage at which necrosuppurative bronchopneumonia becomes pulmonary abscess cannot be defined precisely; the transition may take place rapidly or gradually and may occur at any time.

Acute aerobic pulmonary abscesses occur in two forms: interstitial and segmental. The former are usually very small, multiple, and of varied etiology; they may lie superficially or deeply in the lung and ordinarily present no distinctive clinical or surgical features unless the pleura is invaded. The segmental form of pulmonary abscess is by contrast a lesion of substantial proportions which occupies much or all of the bronchopulmonary segment which had been involved by the antecedent necrosuppurative bronchopneumonia. It is with this type alone that the authors are concerned in the present communication.

Segmental aerobic (non putrid) pulmonary abscess may be classified into three varieties: (1) abscess in the midst of and apparently an incidental part of an extensive area of necrosuppurative bronchopneumonia; (2) abscess as the prominent or predominating lesion but surrounded by a considerable area of necrosuppurative bronchopneumonia; (3) typical abscess with a more or less sharply limited and narrow surrounding zone of involved lung.

Certain pathological features are common to all three varieties. They are all of substantial proportions, usually monolocular and usually situated superficially within one of the lobes of the lung. Overlying adhesions agglutinating the opposed visceral and parietal pleurae were found at operation in all cases. Extensive destruction of all structures including bronchi within the involved area is common. The clinical manifestations are essentially indistinguishable from those of the antecedent and often coexisting necrosuppurative bronchopneumonia. The diagnosis of abscess therefore is usually based upon roentgenography.

In the authors' experience aerobic abscess demonstrates a tendency to subside much more frequently than anaerobic (putrid) abscess. The authors believe therefore that a more conservative attitude toward operative treatment is warranted for the former than for the latter. Although the authors have not as yet completely formulated their indications for operative treatment, they state that in general the results of operation have not been satisfactory except in cases of typical abscess in which the lesion has been single, well circumscribed and surrounded by a sharply limited and narrow zone of in-

volved lung. In a small series of such cases, operation was followed by cure in every instance.

Methods of preoperative localization, a description of the authors' one stage operative technique and details of the operative findings and postoperative treatment are included in the article.

Rienhoff W F Jr. A Two Stage Operation for Total Pneumonectomy in the Treatment of Carcinoma of the Lung Demonstrating a New Technique for Closure of the Bronchus. *J. Thoracic Surg.* 1939; 8: 234.

A two stage pneumonectomy has been devised by the author and employed in a series of 5 cases. Much of the success of his method has been attributed to the fact that the partially filled half collapsed lung that exists following the first stage may act as a cushion which prevents extreme displacement of the mediastinal structure. An additional advantage is the interval of rest which is accorded the patient between stages and the opportunity for adjustment to changed circulatory conditions following ligation of the pulmonary artery and the consequent gradual shifting of the mediastinum.

The author has performed his operation on 5 patients without a death. The left lung was involved in 2 and the right in 3. The ages of the patients ranged from forty seven to sixty seven years and all of the patients were afflicted with a rather advanced carcinoma of the lungs. In each case the lung was found to be definitely adherent to the chest wall and the general physical condition of the patient was such that he was classified as a poor operative risk. Not one of the patients could have lived through a one stage pneumonectomy yet all of them survived the two stage operation.

The pre-operative preparation of these patients consisted of the introduction of air into the pleural cavity to bring about a pre-operative collapse of the lung if possible. Fifty cubic centimeters of beef infusion broth (hydrogen ion concentration 7.45) containing 1 per cent peptone have been used routinely in all cases in which it was possible to bring about a pre-operative collapse of the lung. This injection is given from forty eight to seventy two hours before the operation and serves a two fold purpose: namely it protects the patient against infection and acts as a stimulant to the formation of granulation tissue, the exudation of plasma and the obliteration of the dead space which will result from the removal of the lung.

In the operation itself the anterior approach has been used. It has many advantages over the lateral and posterior exposures. The incision is made over the third interspace anteriorly extending from the lateral border of the sternum to the anterior axillary line. After division of the pectoral muscles the internal intercostals are incised between the third and fourth ribs, the intercostal vessels and nerves being avoided. The pleural cavity is opened by a cut through the parietal pleura for the entire length of the incision and the opening into the chest

DISRUPTION OF ABDOMINAL WOUNDS

Collective Review

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Detroit, Michigan

THE postoperative separation of an abdominal incision, with or without evisceration, is an accident attended by such serious potentialities that it must receive important consideration in any list of postoperative complications. It is fortunately a relatively rare occurrence, the incidence approximating 2 per cent. Many partial wound disruptions undoubtedly go unrecognized, and frequently give rise to incisional hernias. Although the major effect of this catastrophe, in many instances, is an increase in the morbidity alone, the mortality, nevertheless, is extremely high, being variously quoted from 20 to 75 per cent.

The first report of this condition in the American literature is that of Brettauer (14), made in 1899. The article describing the outstanding work of Madelung (66), in 1905, reviews the literature up to that time. Madelung found that wound disruption had been recognized since the earliest days of abdominal surgery, and reports 157 collected cases, 118 occurring in women, and 25 in men. The patients were of all ages, the youngest two days and the oldest seventy-one years. In 124 cases, the incision was below the umbilicus, and in 16 above it. The majority of the incisions were in the mid-line. The critical days were the eighth and ninth. Of the 148 cases in which the end-results were given, 43 terminated fatally. Madelung considered many causative factors: poor catgut, anemia, interference with healing of the wound caused by the stitches being too tightly drawn or too loosely placed, insufficient apposition of the layers and mass sutures, and poor closure of the peritoneum, allowing protrusion of the omentum. He believes that anything which increases the intra-abdominal pressure is also an important factor.

In 1909, Ries (89) reported 6 cases. In the same year, at a meeting of the Western Surgical and Gynecological Society in Omaha, T C Witherspoon (113) reported a case in which there was acute dilatation of the stomach on the eighth postoperative day. A gastrostomy was performed

at that time, and when the sutures were removed preparatory to the completion of the opening into the stomach, wound healing had not taken place. There was no infection, and Witherspoon believed that this lack of healing was due to some trophic disturbance brought about by the toxic effect of abnormal fermentation of the bowel content upon the ganglionic nerve cells in the spinal segment. In discussing this paper, Charles H Mayo (68) brought out the fact that simple abdominal distention produced an internal pressure beneath the suture line and thereby caused an anemia of the tissues about the wound with resulting interference in healing. At the same meeting, C H Wallace (108) stressed sepsis and constitutional dyscrasias, such as chronic nephritis and anemia, as a cause for failure of union of abdominal incisions. In 1911, Robert Morris (74) reported 4 cases of disruption, 2 cases of his own and 2 of his colleagues, and in each instance the accident had occurred following stomach operations. He states that a search of the literature in the library of the New York Academy of Medicine revealed no reference to this subject. He was of the belief that there was some trophic disturbance of the sensory nerves, as suggested by Head (41), which were related to certain superficial zones of the skin which are known to be hypersensitive in connection with irritation of different viscera. In 1912, Crandon and Ehrenfried (23) discussed the importance of sepsis in preventing the adhesion of wound edges.

In reviewing the literature on this subject, we were astonished to note the marked increase in interest during the past ten years, as evidenced by the large number of papers written upon this subject. That the true mechanism of the production of this condition in all instances still remains unknown is evident from the diversities of opinion expressed by various authors. We have attempted to determine and group what seemed to us to be the outstanding points emphasized by various authors, as taken from their individual writings. In addition, we have analyzed 33 cases of wound disruption occurring on the surgical service of the Detroit Receiving Hospital during the past five years.

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HEART AND PERICARDIUM

Borchardt M. Chronic Calculous and Calcifying Pericarditis (Die Pericarditis chronica adhaesiva und das Panzerherz) *J. internat. de chir.* 1939 4:49

Rheumatism is today regarded as the most frequent cause of the severe cases of adhesive obliterative processes in the pericardial sac so often uncovered unexpectedly at autopsy and so frequently not recognized during life. Schmieden and Fischer estimate that these conditions are found in from 1 to 2 per cent of all autopsies. The author urges that unremitting efforts be made toward early diagnosis and treatment and especially that unceasing search be made pre-operatively and postoperatively for foci of infection especially in the tonsils and teeth.

Once the disease has progressed to the point where it is producing symptoms nothing outside of surgical intervention offers any prospect of relief. This may consist in a mere paralyzing of the phrenic nerve on the left side to remove the pull of the diaphragm in accretio cordis or Brauer's removal of the ribs over the cardiac area (cardiolysis). However one should not conclude that accretio cordis or adhesion of the pericardium to the surrounding structures of the mediastinum is not present because there is no systolic indrawing of the chest wall after Delorme's intrapericardial cardiolysis, the cutting of adhesions between the heart itself and the pericardium or the radical Rehn-Delorme cardiac decortication (pericardectomy). Also it must not be concluded

that heart en cuirasse is not present because the roentgenological shadow of the heart is enlarged or because there are murmurs or other evidence of other cardiac conditions.

Results from these various operative procedures still leave much to be desired especially those of the radical Rehn-Delorme procedure. However one cannot very well compare the results of this procedure with the others because the other various procedures are performed for entirely different indications, the less radical being done for simple accretio cordis or intrapericardial strand of adhesion and the more radical for those conditions in which there is an actual immuring of the heart by the thickened perhaps calcified pericardium to such an extent as to interfere with the functional movements or the nutritional blood supply of one or both sides of the heart.

The author's 4 cases which were operated upon radically are reported. The patients were a girl of seventeen years already with vitium cordis who lived for five years following the operation, a woman of twenty-five years who lived for five years in fairly good health after the operation, a woman of thirty-one years who lived under intermittent medical care for cardiac breakdowns for eight years before she was lost for follow-up and a boy of seventeen years who has now enjoyed good health for eleven years since the operation.

Five illustrations depict the author's method of operating. JOHN W. BRENNAN, M.D.

TABLE I—SUMMARY OF 1,458 CASES OF WOUND DISRUPTION

| Name | Cases | Incidence, % | Age, average | Males | Females | Malignancy | Biliary disease | Appendicitis | Ulcer | Illus | Cyn & obst | Miscellaneous | Upper incision | Lower incision | Drainage | Infection | Disruption day | Deaths | Mortality % | Total number of laparotomies |
|--------------------------|-------|--------------|--------------|-------|---------|------------|-----------------|--------------|-------|-------|------------|---------------|----------------|----------------|----------|-----------|----------------|--------|-------------|------------------------------|
| Brettaufer | 3 | — | 41 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 0 | — | 6 0 | 2 | 67 0 | — |
| Madelung | 157 | — | 42 | 75 | 118 | 21 | 0 | 2 | 1 | — | 80 | 53 | 16 | 124 | — | — | 8 5 | 35 | 23 0 | — |
| Ries | 6 | — | 40 | 2 | 4 | 2 | 0 | 1 | 0 | 0 | 2 | 1 | 2 | 4 | 0 | — | 8 5 | 1 | 17 0 | — |
| Shipley | 5 | — | — | 5 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 2 | 3 | 2 | — | — | 0 6 | 0 | 0 0 | — |
| Gusnar von | 22 | 41 | 55 | 11 | 0 | 5 | 1 | 0 | 2 | 1 | 0 | 2 | 0 | 2 | 2 | 4 | 11 3 | 8 | 73 0 | — |
| Horner | 3 | 30 | 34 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 7 3 | 0 | 0 0 | 1010 |
| Monod & Karaly | 6 | — | 43 | 1 | 4 | 1 | 0 | 0 | 1 | 0 | 2 | 2 | 3 | 3 | 0 | 0 | 10 0 | 0 | 0 0 | — |
| Sigalas | 8 | — | 43 | 3 | 5 | 1 | 0 | 1 | 0 | 0 | 5 | 1 | 2 | 6 | 2 | 1 | 9 8 | 1 | 14 0 | — |
| Sokolov | 723 | 2-3 | 43 | 407 | 230 | 169 | 63 | 29 | 120 | 57 | 94 | 101 | 220 | 67 | 49 | 93 | 8 4 | 226 | 34 0 | — |
| McCauliff | 3 | — | 49 | 2 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 8 3 | 0 | 0 0 | — |
| Starr & Nason | 15 | 61 | 47 | — | — | 5 | 2 | 3 | 0 | 1 | 4 | 0 | 6 | 9 | — | — | — | — | — | 2455 |
| Ehason & McLaughlin | 25 | 27 | — | 19 | 6 | 6 | 6 | 1 | 11 | — | 0 | 1 | 22 | 3 | 8 | 6 | 6 1 | 8 | 32 0 | 9153 |
| Meleney & Howes | 56 | 1 00 | 51 | 41 | 15 | 19 | 16 | 6 | 5 | 3 | 1 | 6 | 35 | 17 | 20 | 35 | 7 5 | 30 | 54 0 | — |
| Colp | 29 | 90 | 42 | 14 | 12 | 8 | 7 | 5 | 0 | — | 5 | 4 | 10 | 14 | 13 | — | — | 8 | 28 0 | 2750 |
| Grace | 46 | — | — | — | — | 10 | 8 | 7 | 11 | 2 | 0 | 8 | 39 | 7 | — | 17 | 7 6 | 18 | 39 0 | — |
| White | 33 | — | 46 | 23 | 10 | 6 | 6 | 3 | 9 | 2 | 0 | 7 | 19 | 12 | 10 | 10 | 8 7 | 18 | 55 0 | 2145 |
| Heyd | 8 | 25 | — | — | — | — | — | — | — | — | — | 8 | — | — | — | — | — | 2 | 25 0 | — |
| Maes, Boyce & McFetridge | 44 | — | 32 | 21 | 23 | 5 | 2 | 10 | 1 | 3 | 8 | 15 | 11 | 33 | 10 | 9 | — | 13 | 30 0 | — |
| Koster & Kasman | 17 | 22 | 40 | 13 | 4 | 2 | 4 | 5 | 4 | 0 | 1 | 1 | 10 | 6 | 7 | 6 | 7 8 | 3 | 18 0 | 7892 |
| Milbert | 20 | 1 30 | 53 | 17 | 3 | 8 | 7 | 0 | 3 | 0 | 2 | 0 | 13 | 3 | 9 | 7 | 8 3 | 11 | 55 0 | 1560 |
| Glasser | 8 | 24 | 48 | 6 | 2 | 0 | 2 | 0 | 3 | 0 | 1 | 2 | 7 | 1 | 4 | 3 | 8 8 | 5 | 63 0 | 3224 |
| Bettman & Lichtenstein | 32 | 43 | 44 | 10 | 22 | 6 | 6 | 1 | 2 | 4 | 13 | 0 | 11 | 21 | 3 | 4 | 7 9 | 12 | 38 0 | 7500 |
| Jenkins | 36 | — | 50 | 28 | 8 | 19 | 7 | 2 | 3 | 1 | 0 | 4 | 26 | 9 | 7 | 13 | 9 0 | 13 | 36 0 | — |
| Boland | 12 | 28 | 30 | 7 | 5 | 1 | 1 | 2 | 0 | 5 | 3 | 0 | 4 | 8 | 2 | 3 | — | 8 | 66 7 | 4337 |
| Glenn & Moore | 22 | 75 | — | 20 | 2 | 6 | 8 | 1 | 1 | 3 | 0 | 3 | 14 | 7 | 8 | 5 | 8 0 | 10 | 45 0 | 2927 |
| Fallis | 50 | 64 | 43 3 | 27 | 22 | 8 | 10 | 8 | 3 | 28 | 14 | 0 | 26 | 23 | 19 | 10 | 7 6 | 17 | 34 0 | 7903 |
| Totten | 47 | 24 | — | 33 | 14 | 7 | 2 | 4 | 6 | 4 | 5 | 19 | 21 | 12 | — | 17 | 6 5 | 19 | 40 0 | 19473 |
| Hartzell & Winfield | 33 | 50 | 46 | 21 | 12 | 3 | 3 | 5 | 9 | 3 | 6 | 4 | 20 | 12 | 10 | 9 | 8 3 | 14 | 42 4 | 6532 |
| Total | 1458 | | | 756 | 537 | 320 | 162 | 97 | 195 | 118 | 253 | 334 | 559 | 512 | 192 | 252 | | 482 | | 78,863 |
| Average or % | | 1 83 | 43 | 7158 | 5141 | 5220 | 111 | 6 | 13 | 4 | 8 | 117 | 422 | 0 | | | 8 24 | | 34 8 | |

This table originally compiled by Jenkins (50) contained 1,294 cases. We have added the last 5 reviews comprising 164 additional cases. The averages or percentages given in the table, were calculated on the basis of the number of cases in which the data for that column was available. This did not correspond with the total number of cases reported in each instance (50). The average or percentage given in the incidence, age, average disruption day, and mortality per cent columns are weighted values.

have been unable to arrive at a definite opinion as to whether or not wound disruptions occur more frequently in any one race as compared to another. In our series, the incidence in the Negro race was 24.3 per cent, 8 cases, as compared to the incidence in the white race of 75.8 per cent, 25 cases. This indicates a slightly higher incidence in the Negro race, since our usual hospital proportion of Negro to white patients is normally

1 to 4. However, Maes, Boyce, and McFetridge (67) stated that the incidence in the Negro race was slightly smaller than in the white race. Boland (13) likewise reported a lower incidence in the colored race, 28 per cent, and concludes that a possible explanation may be found in the tendency to keloid scar formation. The difference in incidence between the white and colored race is very slight, and it is questionable whether this

No discussion of wound disruption would be complete without consideration of the fundamental contributing factors of wound healing proper closure of incisions strain on suture lines and the reaction of tissue to suture material Of these the most important is wound healing a subject which has been reviewed so recently and so exhaustively by Arey (6) that it appears superfluous to enter into an extensive discussion of it here Since it is difficult to separate the factors as regards their relation to wound disruption we shall not attempt to discuss them as separate entities but will relate them to the subject in appropriate places throughout this review

It is not possible to determine the exact incidence of wound disruption An approximation is possible but this is likely to be none too accurate because of the small number of cases in any one report and the vagaries of sampling Reports of wound disruptions are more likely to emanate from institutions where large numbers of cases are cared for and where established routine is customary Smaller institutions or institutions where the number of disruptions are rare are not likely to study the incidence of wound disruptions In complete disruptions or cases in which secondary closure was not carried out are frequently omitted from classification a point which has been stressed by Meleney and Howes (71) The incidence is therefore quite likely to be estimated too low This is true of the recorded incidence in our series of 6532 cases in which there were 33 disruptions an incidence of 0.5 per cent and we believe that from 1.5 to 2 per cent would be none too high While most authors give an incidence of from .22 to 1 per cent, higher figures are reported The impression of Sokolov (97) that a proper figure would be approximately between 2 and 3 per cent is a viewpoint that is more in line with our estimate

The following summary (Table I) lists the incidence of wound disruptions reported by various authors with other pertinent data Since this is a compilation of 1458 cases of disruption and in many instances the total number of cases from which these cases were taken was not given the actual incidence in the entire group cannot be determined Obvious separation of the wound edges which threatens the integrity of the abdominal wall is likely to be the only type of wound difficulty listed as disruption However any type of wound complication which does not permit of complete healing of the wound in all layers should probably be included and if this subject were considered in this light as suggested by many authors (10 38 46 48 17 55 60) the incidence

would be much higher and would include all cases of incisional hernia

It seems generally agreed that the greatest number of disruptions statistically occur in patients ranging in age from twenty to sixty years Cases are reported in infants and in patients past seventy Although it is believed that the extremes of age predispose to disruption the reason for the difference probably lies in the fact that most surgical procedures are performed on people between the ages of twenty and sixty years In our series the youngest patient was twenty five years of age and the oldest sixty two The greatest number of disruptions 11 occurred in the sixth decade and 8 occurred in the third to the sixth decades The average age for our series was forty six years The average age for the entire series was forty four years

From our own personal observations and the majority of the reports in the literature there would appear to be a preponderance of disruption in the male sex as compared to the female This roughly bears the relation of 2 males to 1 female However one is struck by discrepancies in the various reports The opinion is expressed that women have a greater inherent tendency to withstand surgical procedures (22 72) and that men because of various physical factors and greater muscular development have a slight predisposition to disruption In the earlier report by Sokolov (97) the incidence of disruptions was placed at 2 males to 1 female Sigalas (94) Maes Boyce and McFetridge (67) and Bettman and Lichtenstein (12) found a greater number of disruptions in the female The statement appears quite frequently that the incidence of occurrence is about equal in the sexes or that the difference is of no great importance (13 10 61 45) Unfortunately many authors do not give the total number of laparotomies performed on men and women although some as Bettman and Lichtenstein (12) definitely state that their series contains more women than men In our series disruptions occurred in 21 males and 12 females a ratio of 1.75 to 1 Gynecological laparotomies were included Thus our ratio would tend to show a higher incidence in males than females However this probably does not represent the true state of affairs for the reasons pointed out before and it is our personal opinion that although there may be a higher incidence in the male sex the true ratio is probably about the same in both sexes or only slightly higher in the male

In only a few of the reviews has any special mention been made concerning a greater or lesser tendency toward disruption in various races We

state owing to long periods of ill health and restricted diet. They have observed that wounds heal badly in these patients. Hess (44) agrees with these observations. Wolbach (114) sums up the picture of Vitamin-C deficiency as related to wound healing as follows: in general, the pathological picture "is produced by resorption of intracellular materials in growth and reparative reactions." He states further that "histologic repair, following the administration of vitamin C in natural foods or as cevitamic acid, is dramatic in character and promptness," within twenty-four hours all normal processes of repair are resumed.

Youmans (116) believes that, although frank scurvy is rare, in contrast, mild or latent scurvy or a slight deficiency in Vitamin C is probably very common. Ingalls and Warren (51) report 20 cases of peptic ulcer, in all of which there were low Vitamin-C values. They believe that there is an important relationship between low Vitamin-C values and the inability of an ulcer to heal and its tendency to bleed. Therefore, they urge a check of the Vitamin C of the blood plasma before such cases are subjected to surgery. Taffel and Harvey (101) report that the tensile strength of stomach wounds in the partially scorbutic guinea pig is markedly decreased from the eighth to the tenth days. Lanman and Ingalls (64) have shown that guinea pigs maintained on approximately one-fifth of the minimal preventive dose of ascorbic acid exhibited healing of operative incisions inferior to that of normal controls. Lanman (63) says asymptomatic scurvy is far more common in infants and children than is realized, and presents evidence to show that a partial Vitamin-C deficiency is of more importance in the healing of surgical wounds in human beings than has hitherto been realized. Sokolov (97) recommends a diet rich in Vitamin C and considers partial Vitamin-C deficiency to be a definite factor in poor wound healing.

The effect of low serum protein upon wound healing has been studied by many investigators. A recent paper by Thompson, Ravdin, and Frank (102) aptly summarizes this phase of the subject. "Clark (18) showed that on a diet high in protein there was no quiescent period in the repair of the wound in his dogs, the contraction beginning at once. In the review of Arey (6) on 'Wound Repair,' one is struck with the fact that many of the factors associated with repair are directly or indirectly dependent on a diet high in protein. Thus, animals fed on a diet of this type showed accelerated fibroblastic proliferation (39). Cellular activity on the whole, greatly increased (11). The quantity of secretion from the wound was decreased (91). A diet high in carbohydrate, to

which alkalis have been added, increased the quantity of this secretion (91). The wounds of animals on an alkaline diet are said to be more easily infected (43).

"Thus, there are a number of factors both in the dog, and in the patient who is subjected to a prolonged and serious protein deficiency, which favors disruption of the wound. It has been observed that, when cultures of growing cells are surrounded by an overabundance of fluid of low viscosity, cell motility is retarded. Our experiments would tend to support the theory that certain of the amino-acids are essential for the stimulating of tissue growth (79, 2, 90)."

These authors (102) found that in a high percentage of dogs with well advanced hypoproteinemia, evisceration or breakdown of the wound will occur after laparotomy. Thompson, Ravdin, Rhoads and Frank (103) found further that catgut loses its tensile strength more rapidly in the presence of hypoproteinemia, and also that they could restore serum protein to normal in hypoproteinemic dogs by means of intravenous injections of lyophile plasma, and in these animals the wound healed normally. Whipple and Elliott (111) and Stone (100) also believe hypoproteinemia is a factor in the production of wound disruption.

The possibility that the sensitivity of the patient to catgut suture material may have some bearing on wound healing has been investigated by many observers. Babcock (7) considered that both the edema and serosanguineous discharge which follow thyroidectomy when catgut is used were due to sensitivity to catgut. When silk was substituted for catgut in thyroidectomies, these reactions were eliminated. Hinton (46) observed that catgut suture material frequently disappeared from the clean disrupted wound. He pointed out that this rapid absorption could be an allergic reaction. Jenkins (52) stated "when absorbable suture is used, the rapidity of digestion of the approximating suture material should be considered a factor of significance." Kraissl, Kesten, and Cimotti (59), in a recent experimental and clinical investigation upon this subject, demonstrated that guinea pigs may be sensitized to catgut, which if again introduced caused a marked local reaction. This frequently resulted in a rapid absorption of catgut from the wound. They performed skin tests upon 332 patients and obtained a positive reaction in 14.15 per cent. This incidence greatly increased with a history of allergy or of a previous operation. They suggest that when catgut is used, this factor of wound disruption may be eliminated by testing patients

difference is real. We have been unable to find any definite reference to variations in incidence in wound disruption in other races with the possible exception of a notation by Sokolov (97) who states that disruption is more often seen in northern people during winter and spring. This indicates however that this observation may be based on a possible seasonal variation—a finding which he attributes to lack of Vitamin C in the diets of northern people in the winter. Our highest incidence occurred in the months of March, November and December 5 cases for each month. From November to April there were 20 disruptions as compared to 13 for the period from May to October. This might suggest that respiratory diseases favor this complication and this suggestion might find weight on the basis that respiratory diseases produce coughing and restlessness or slightly lower the patient's vitality and thus play a rôle in wound disruption. However the difficulty in making such a comparison is great since the seasonal variation of respiratory complication following operative procedures is not a very clear cut one (86). While most writers on the subject of wound disruption make no reference to seasonal variations, Fallis (30) noted a much higher incidence in March, April and May. Colp (22) could find no seasonal relationship and Rakhman (83) and Maes Boyce and McFetridge (67) believe it has no bearing on the subject.

The exact evaluation of the importance of individual disease, the patient's general condition and other factors attributable to the patient in the production of wound disruption is difficult. Certain it is that a patient in poor condition before, during or after an operation will fall in the class of potential wound disruption cases. Any factor which interferes with normal wound healing is naturally of great importance. Debilitating diseases causing anemia and cachexia (97, 3, 10, 72, 22, 34, 111, 42, 85, 78, 48), Vitamin C deficiency (115, 5, 114, 44, 116, 51, 101, 64, 63, 97), hypoproteinemia (102, 103, 39, 79, 2, 90) and allergy (7, 46, 52, 59, 112, 30, 111) have been stressed frequently as predisposing toward wound disruption.

In our series wound disruption occurred most frequently (6 times) in the ruptured peptic ulcer cases. This is not remarkable when one considers (1) the patient's pre-operative condition (2) bad risks, 2 fair risks, 1 good risk; (2) the potentiality for infection; (3) the possibility of a stormy post-operative course. A very considerable number of ruptured ulcer cases come to our hospital averaging 35 to 40 a year. The next greatest number of disruptions occurred in cases of gunshot wounds

of the abdomen (2 of the patients were in a critical condition before operation, 1 in fair condition and 1 in good condition). In only 3 cases was malignancy the primary disease. Myoma of the uterus was the disease in 3 cases and in 2 more cases this was associated with another underlying pathological condition. Eleven of these patients were in a poor or critical condition, 2 were in a fair condition and 10 were in a good condition. Nine patients had a definite anemia, either pre-operative or postoperative; only 3 had positive Kahn reactions.

It will be seen that in many of these cases the general condition was such that one might have expected a higher incidence of disruption than the average. All of the patients were quite ill or had a previously co-existing general disease, anemia being an important factor. The cases of reported ulcers were by and large cases in which dietary regime had been deficient and as a rule these patients were not properly nourished. It is quite surprising that there was but a small group of cases in which cancer was the factor. Malignancy has been emphasized by a majority of writers on this subject and comprises 2 per cent of the diseases associated with wound disruption in the total of the reported series. In addition to gastric and duodenal diseases, uterine fibroids and biliary diseases figure prominently in the list of primary diseases. A shocking surgical procedure or a complicated and stormy postoperative course in a patient who is quite ill may likewise predispose to wound disaster. Recently there has been much concern about Vitamin C deficiency chiefly with respect to subclinical levels of this vitamin. Naturally the concept of Vitamin C deficiency with regard to difficulties in wound healing is not new.

Richard Walter's account of Lord Anson's Voyage Around the World (107) in 1740 vividly describes the effects of scurvy among the crew. Scars of wounds that had been for many years healed were forced open—one of the invalids—who had been wounded fifty years before—and had continued well for a great number of years past yet on his being attacked by the scurvy his wounds in the progress of the disease broke out afresh and appeared as though they had never been healed.

Wolbach and Howes (115) demonstrated that the histological basis for the failure of wounds to heal in the presence of a Vitamin C deficiency lies in the inability of the supporting tissues to produce and maintain intracellular cement substance. Archer and Graham (5) believe that many patients with gastric disease are in a subscurvy



Fig 1 Batson's (10) dissection to show the nerve supply and the sheath of the rectus muscle. The continuation of the fleshy fibers of the transversus abdominis muscle behind the aponeurotic sheath is shown. In a less well muscled individual, these appear as a fascial plane (*Surgery*, 1938, 3 871)

make a satisfactory serosa to serosa closure of the peritoneum, because of the lateral pull of the so-called posterior sheath of the rectus muscle. Sometimes the suture would cut through the peritoneal margin again and again, until there was no hope of making a smooth closure of the frayed edges. Finally a few stitches were probably placed far out into the rectus muscle, in a desperate but vain effort to overcome the difficulty, and to have no raw surface facing the viscera.

"In the hands of many operators, this manner of opening the abdomen is chosen solely because of its fancied convenience to the operator, and without due consideration of the fact that in every longitudinal, transrectus, or para rectus incision, irreparable damage may be inflicted on the patient."

Many writers state that the length of the incision is of little consequence, and quote the old adage that incisions heal from the side and not from the end. Sloan (96) states, however, that the danger of hernia with longitudinal incision increases in proportion to the square of the length of the incision. He has devised an incision which splits the anterior rectus vertically (Fig 3), and

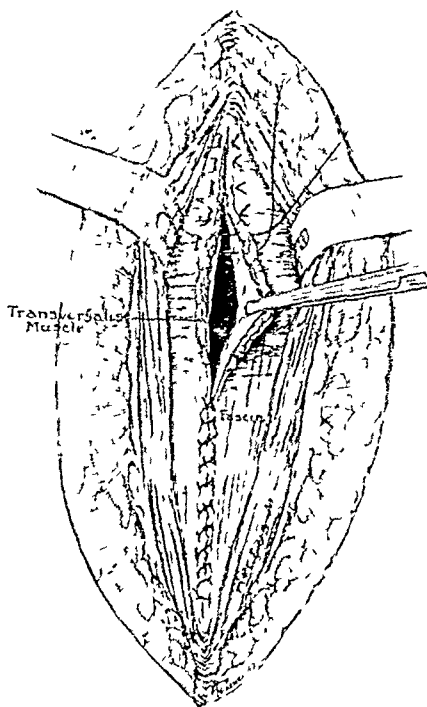


Fig 2 Clute (20) stresses the importance of placing mattress sutures through the transversalis muscle, fascia, and peritoneum, to take the strain of the transversalis pull in postoperative vomiting and moving (*Surg Clin North Am*, 1929, 9 1403)

the transversalis fascia transversely (Fig 4), somewhat after the principle of McArthur (69). He states that this is easily closed, even in the absence of abdominal relaxation, and that the danger of wound separation is almost entirely eliminated. Many authors have stressed the advantages of the transverse incision for upper abdominal surgery (98, 76, 31). Singleton (95) also describes an excellent transverse incision in which the rectus is retracted medially, and the posterior sheath of the rectus and the peritoneum are then cut in the direction of the fibers of the internal oblique and transversalis muscles. Glenn and Moore (34) state "the mid left rectus and transverse rectus incisions are rightfully used with great reserve, for the incidence of evisceration in both is very high." However, their conclusion regarding the transverse-rectus incision is based on a single case.

When making a low midline incision, Horner (48) believes that a stronger closure may be obtained by following the method of DeLee cutting

pre operatively thereby decreasing the incidence of wound disruption White (112) Fallis (30) and Whipple and Elliott (111) likewise considered allergy a factor

Many other conditions specific and otherwise have been reported as predisposing to disruption Obesity (36) phlebitis (25 26) and diabetes (93) are among the many conditions which are presumed to presage a high incidence of wound disruption These conditions apparently are not important in themselves but are only of importance as they affect wound healing in general The presence of syphilis has been mentioned by several writers (34 12 13) who believe it has little relationship to wound disruption

The influence of the type and position of the incision is generally considered of great importance in the matter of wound disruption However it is difficult to evaluate the importance of these factors as related to wound healing The greater number of disruptions occur in upper abdominal vertical incisions particularly of the rectus splitting type In the majority of the surveys which have been made this has been the incision most commonly used and therefore most likely to disrupt on the basis of its most frequent use Also upper abdominal incisions are more likely to be used in the presence of serious illnesses In our own series the majority of disruptions occurred in vertical incisions of one type or another and the majority of these were in the upper abdomen The actual data regarding the position and type of incision in our 33 cases were as follows upper abdominal vertical incisions 18 cases mid abdominal vertical incisions 4 cases lower vertical incisions 9 cases there was 1 drained McBurney incision and 1 subcostal incision Thus a great preponderance followed vertical incisions most marked in the upper abdomen These figures are in general accord with the majority of reported series (112 38 70 28 57 34 33 72, 104) There are but few writers who consider the type of incision of little importance (45 61 99) In surgical lesion of the abdomen it is difficult to arrive at a definite evaluation of the various incisions however we feel that the evidence tends to militate against vertical abdominal incisions and therefore urge the use of transverse and oblique muscle and fascia splitting incisions whenever possible During the past two years on the general surgical service at Receiving Hospital it has been our practice to use the muscle splitting incision of gridiron or McBurney type in practically all cases of appendicitis or in any other condition where it is feasible In addition we have been employing in the past year a small transverse

upper abdominal incision as described by Amendola (4) when operating upon ruptured peptic ulcer cases Also we usually use the subcostal or Kocher (56) incision in biliary surgery To date none of the small transverse incisions have disrupted It is our opinion that the small upper right transverse incision as used for ruptured ulcer cases is a definite advantage not because disruption may not occur but if it does there is far less likelihood of evisceration During the past two years we have become more and more inclined to the use of transverse or muscle splitting abdominal incisions and it is gratifying to note that not a single case of disruption has occurred in this group of cases

Batson (10) has shown that anatomically the transverse incision for upper abdominal surgery possesses certain advantages in preserving the nerve and blood supply (Fig 1) There is another factor which favors the transverse incision in upper abdominal surgery which is frequently overlooked namely the preservation of the transversalis muscle Sloan (96) Singleton (95) and Clute (20) emphasize the importance of this structure When the muscle is severed in vertical upper abdominal incisions it tends to pull the peritoneal layer apart and thus allows a tab of omentum or knuckle of bowel to protrude through the muscle layer (Freeman's Theory) (32) Clute (20) believes that the peritoneum and transversalis muscle should be sutured with interrupted mattress sutures (Fig 2) Whipple and Elliott (111) recognize the importance of the lateral pull of the oblique and transversalis muscles in the vertical incision and stress the importance of a careful secure closure of the peritoneal layer (See illustration described under technique) This fact is further stressed by Shipley (92) who states A very important thing is the transverse direction of the deeper layers of the abdominal wall giving poor support to the suture line of a vertical incision This fact has also been recognized by Pool (82) who stressed the importance of suture of the posterior sheath and also by Lynn (65) DeMuth (24) Meleney and Howes (71) and others

Writers who stress the advantages of vertical incisions frequently emphasize the value of not splitting the rectus muscle and of retracting it laterally so as to preserve the nerve and blood supply (53 77) Rarely however is mention made of the disadvantage of this incision namely the severance of the transversalis muscle In 1913 Quain (84) wrote All those who have made a number of gallbladder operations through longitudinal incisions in tense abdominal walls will remember instances when it seemed impossible to

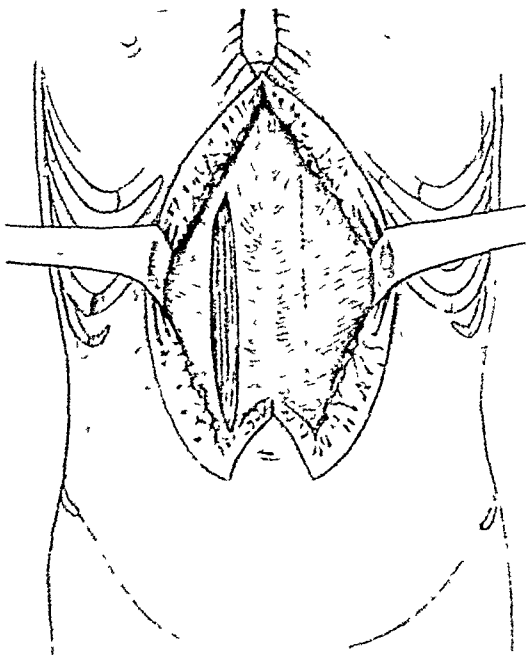


Fig 3 Sloan (94) makes a midline incision through the skin, and vertical incisions through the external sheaths of the recti about 1 cm external to their inner borders. The amount of exposure will depend upon the length of these two incisions (*Surg, Gynec & Obst*, 1927, 45 678)

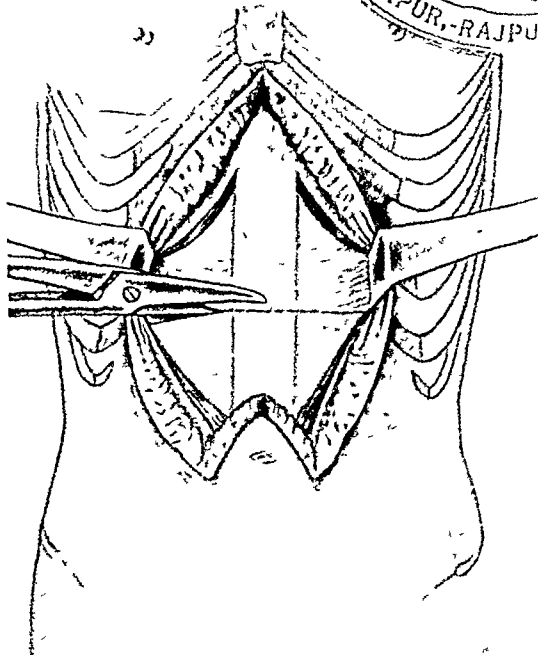


Fig 4 After the retractors are in place and the posterior sheaths of the recti are exposed, a transverse incision is made through the posterior sheath and peritoneum, as shown here (*Surg, Gynec & Obst*, 1927, 45 678)

gut doubled for the peritoneum and posterior fascia, continuous chromic catgut No 2 doubled for the fascia, and silk-worm gut tension sutures through the skin, muscle, and fascia. Ten cases had been closed with continuous plain No 1 catgut doubled for the peritoneum and posterior fascia, interrupted chromic catgut No 2 for the fascia, and silk-worm gut tension sutures, as above. Continuous chromic catgut No 2 for the peritoneum and posterior fascia, interrupted chromic catgut No 2 for the fascia, and steel-wire tension sutures were used in 3 cases. In 2 cases continuous plain catgut No 2 was used for the peritoneum and posterior fascia, interrupted chromic catgut No 2 for the fascia and no tension sutures. One case was closed with interrupted silk for the peritoneum, continuous silk for the fascia, and no tension sutures. Continuous plain No 1 catgut was used for the peritoneum, and through-and-through silk-worm gut sutures were used in 1 case.

As can be seen, 6 different methods of closure were used in the 33 cases of disruption. Over the five-year period, numerous surgeons were performing operations. At the present time, we are

adopting a more definite general policy in the technique of closure, which may be summed up as follows:

1 For clean cases, fine grade continuous silk for the peritoneum and posterior fascia, interrupted silk for the anterior fascia, and steel-alloy-wire tension sutures, sometimes through and sometimes down to the peritoneum.

2 For infected cases, continuous No 1 chromic catgut¹ for the peritoneum and posterior fascia, interrupted No 1 chromic catgut for the fascia, and steel-alloy-wire tension sutures, as above. We have used through-and-through steel or silver wire interrupted sutures occasionally in badly infected cases, or in those in which disruption was feared, and are considering their wider use, but we cannot accurately evaluate this method at the present time.

It must be appreciated that although the majority of cases in any reported series may have been primarily closed by a definite method, with definite suture material, there is no indication

¹As this paper goes to press a brand of No. 00 and No. 000 chromic catgut has been brought to our attention. We have tried this in a few cases and are impressed by its excellent tensile strength and apparent lack of irritating qualities.

the structures at different distances from the mid line thereby staggering the incisions in different layers so that no structure is opened in the plane of the one immediately above it. Even when the entire incision is in the same plane it is possible to overlap the edges to get the same effect as cutting in different planes. This is confirmed by Morton (75). Sloan (96) advises a transverse incision on the order of that described by Pfannenstiel (80) to eliminate the dangers of postoperative hernia and wound separation.

The technique method and type of material used in primary wound closures has been a subject of much discussion in recent years. There are those who believe that absorbable suture material is the material of choice and generally the cause for this choice lies in the fear of infection and foreign body reaction in the wound which tend to ward subsequent abscess and sinus formation. While this may be a troublesome complication those in favor of non absorbable suture material such as silk base their contention of its superiority on the basis of its greater and more persistent tensile strength with a much smaller volume of suture material (111 106).

Occasionally in cases of wound disruption in wounds closed with catgut it has been impossible to find any evidence whatsoever of suture material in the wound. This is frequently so striking despite the fact that it might be difficult to find the catgut even though it were there that we feel the reported absence of catgut is a reality. This rapid absorption of catgut has been attributed to catgut allergy but it is well known from the work of Howes (49), Rhoads, Hottenstein and Hudson (88) and Jenkins (52) that the tensile strength of both plain and chromicized catgut irrespective of size decreases rapidly and decreases even more rapidly in the presence of blood serum (45 57 13 50 62 37) or inflammatory exudate. Howes (49) believes that if the presence of serum or infection can be foreseen a removable non absorbable suture should be used in closure of the wound. Kraissl (58) has observed further that the presence of intestinal ferments hastens the absorption of both plain and chromic catgut. Also he noted that there are certain intrinsic factors which result in the loss of tensile strength. Certain brands of catgut contain foreign bodies and flaws which appear to be due to splicing. The rate of absorbability of catgut is to some extent dependent on the age of the animal from which the catgut is prepared according to Trout (105).

Those who are adherents of silk technique stress the great care that is necessary in the closure of clean cases. Other suture material has been sug-

gested because of the minimal amount of reaction brought about in the tissue. Chief of these are fine stainless steel wire as proposed by Babcock (7) and a newer substance made from plastics as suggested by Collins and Bellas (1). A study of the literature with regard to the incidence of wound disruption following the use of various suture material reveals no data of value. In one series reported by Glenn and Moore (34) in which layer suture of silk was used there were 7 disruptions in 144 cases an incidence not particularly different from that reported by other authors in cases in which catgut undoubtedly was used. In 1903 Madelung (66) stated in his review that the employment of any one type of suture material was not proof against wound disruption. Other authors concur in this opinion (94 12 12) which seems to us to be axiomatic as wounds heal across the line of incision and not by means of sutures. The suture material is placed to approximate tissues rather than to bind them. The advocates of the use of silk (111 71 34) stress careful handling of the tissues the use of the finest and highest grade of silk the careful approximation of tissues without tension and the avoidance of strangulation of large masses of tissues. These factors in themselves appear important to us not only in aiding primary union but in the prevention of infection as well. Accordingly Maes, Boyce and McFetridge (67) believe that catgut as used by Howes (49) with silk technique is probably as safe as silk and question the general use of silk in wound closures. The use of silk in infected cases is viewed with disfavor (71 34 111) and the use of catgut and silk buried in the same wound is not good practice (111). Unquestionably the reaction of tissues to large strands of catgut is much greater than that found about silk sutures ordinarily used and the use of both types of sutures together has a tendency to provide for a prolonged marked reaction in the wound. Nisnevich (78) reported 8 cases of disruption all of which were closed with mixed catgut and silk sutures. The use of through and through silver wire sutures after the manner of Reid Zininger and Merrell (87), is advised by several authors in selected cases (34 67). One writer Kennedy (54) reports 30,000 laparotomies closed without attention to approximation of the layers with heavy non absorbable material without a single disruption. This is a striking record and these results are difficult to evaluate on the basis of modern concepts and experiences in wound healing.

In this series 16 cases of disruption had been closed in layers with continuous plain No. 1 cat

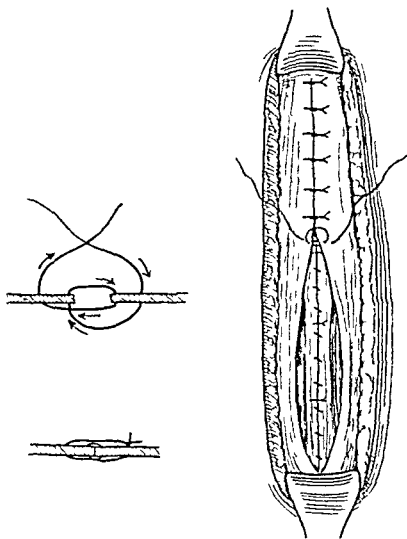


Fig 5 Whipple and Elliott's (111) method of fine-silk closure of a clean abdominal incision. The peritoneum is closed with a continuous fine-silk suture, and is then reinforced every 2 cm with interrupted silk sutures. The fascia is then closed with the "far and near" stitch (*Ann Surg*, 1938, 108 741)

Abbott and Johnston (1), will obviate most of the mechanism and danger from increased intra-abdominal pressure due to intestinal distention. It has been pointed out by Horner (48) and Meleney and Howes (71) that hiccough, vomiting, and distention may not only cause disruption, but they may be present as a result of an unrecognized partial obstruction, while Bettman and Lichtenstein (12) state that coughing and vomiting are of relatively little importance. Many authors (48, 94, 99, 8, 24, 42, 40, 33) stress the value of an efficient abdominal support (Fig 6). In summing up the general opinions in the literature, it may be said that conditions increasing the intra-abdominal pressure (72, 57, 104, 76, 27, 13, 33, 22, 99, 67, 66, 97, 112, 35, 85, 9, 29, 78) in the main probably act as contributory factors and occasionally as causal factors in the disruption of wounds.

The importance of infection is somewhat debatable, but it is our belief that it must be considered as a contributing factor and, in some instances, an exciting factor in the disruption of wounds. The expressed or implied viewpoints of various authors concur with the above opinion (97, 3, 85, 112, 111, 28, 99, 35, 19). It is easily understood how gross infection could materially affect wound healing, as there is an increase in the exudative period, a delay in the reparative



Fig 6 Horner (46) advises the use of an efficient abdominal support in the form of an adhesive corset. The one illustrated permits of frequent inspection of the incision (*J Am M Ass*, 1929, 90 1126)

stage, and an increase in the rapidity of absorption of catgut (28, 72, 48, 60, 71, 13, 52, 104, 50). On the other hand, there are cases which show no signs of gross infection which disrupt, but it has been pointed out by Meleney and Howes (71) and Sigalas (94) that there are a considerable number of these cases which are in reality contaminated. In our series, 16 of the 33 cases of disruption were infected. Although 4 other cases which were potentially infected disrupted, no gross infection could be demonstrated. In 1 of the latter cases the patient had undergone a posterior gastrojejunostomy. One patient had a gunshot wound of the duodenum and ileum, 1 had a perforation of the transverse colon, and 1 had a stab wound of the abdomen with evisceration of the bowel through the wound. Thus our total of contaminated and infected cases would be 20 out of 33 cases.

Bettman and Lichtenstein (12), Glasser (33), and Colp (22) believe that infection cannot be considered as a major factor in disruption. Maes, Boyce, and McFetridge (67) point out that the importance of infection is debatable and disputed, and also that only a relatively small number of the total of infected wounds disrupt. In the presence of infection, disruption of the abdominal wound seems to be attended by a higher mortality (3, 70), although it must be understood that the underlying pathological condition, such as peritonitis, may materially affect this evaluation.

In any case in which there is fear of a wound disruption, particular attention must be given to

that this is the method and material of choice of the author especially since in many instances the author has used cases for his study which were operated upon by many other surgeons. This has been the case in the series we have reported.

Exact coaptation of the structures especially the peritoneum is important (32) since a wedge of omentum or other intra abdominal content may prevent healing of the peritoneal layer. The importance of careful closure of the peritoneum cannot be too strongly stressed and many authors have taken the trouble to go into detail about this matter (3 48 15 55 99 45 13 60 104 71 72 28) Clute (19 20) especially stresses this point in the closure of upper abdominal incisions and in addition is careful to secure accurate approximation of the transversalis muscle and fascia which he closes with the peritoneum as one layer by means of interrupted mattress sutures (Fig 2). The use of tension sutures frequently affords protection against evisceration should disruption occur. Their primary purpose is to relieve tension on the suture line at the edges of the incision. It is very doubtful whether they do this except under the stress of coughing and moving about. If used tension sutures should be of material which causes very little reaction in the tissues. We have found the use of stainless steel wire best suited for this purpose. In healthy individuals in whom good wound healing is to be expected it is not likely that they would be of great advantage. In cases in which disruptions are likely to occur because of debility infection or severe stress upon the wound they may give comfort to the surgeon.

Whipple and Elliott (111) believe tension sutures are unnecessary and sometimes result in infection and they advise against their use. However they advocate what amounts to a buried tension suture the far and near stitch. They advise closure of the peritoneum posterior rectus sheath or transversalis fascia with continuous suture of fine silk reinforced at 2 cm intervals with interrupted silk sutures. The far and near stitch is an interrupted suture of fine silk (Fig 5) and is placed in anterior rectus fascia. In our own work we are inclined to use fine silk treated to diminish porosity in all clean cases with careful attention to approximation in layers. In contaminated or infected cases we use a No. 1 catgut employing the silk technique. We are not adverse to placing tension sutures of fine stainless steel through the layers of the abdominal wall to the peritoneum for added safety in cases in which we suspect there may be difficulty with the integ-

ity of the wound. It is only occasionally that we resort to the use of buried stainless steel wire and this chiefly in the repair of large ventral hernias. In no instance have we found any undue reaction to this material and in none of the cases have we had a disruption. However the number of cases so treated have been small.

It should be stated here that an efficient and smooth anesthetic is an important factor in obtaining a satisfactory closure with a minimum of trauma (45 13 99 57 40 104). Some writers deplore arresting the anesthesia too soon and the too energetic use of carbon dioxide at the close of the operation to prevent atelectasis.

We believe that drainage through the operative wound probably favors to some extent the production of wound infection by increasing the incidence of wound infection and by allowing the protrusion of omentum or intestines into the depths of the wound about the drain. This is in agreement with the opinion held by Maes, Boyce and McFetridge (67) and Jenkins (52). Certain authors specifically stress this latter point (13 104 67). If we assume that the majority of the total number of cases operated upon probably were not drained the reported number of drained cases which disrupted assumes considerable importance. This consideration is mentioned by Meleney and Howes (71). In our series 10 of the 33 cases were drained 2 through a stab wound with no drains in the major incision. It would seem logical when possible to use stab wound drainage at some distance from the operative incision (33 30 52). When it is necessary to bring a drain out through an operative incision which has been closed in layers we believe it best to approximate the wound margins with interrupted sutures about the drain and not rely on a running or continuous suture.

Postoperative complications which tend to increase intra abdominal pressure such as respiratory lesions with coughing vomiting undue straining and distention play an important part in wound disruption. However it must be understood that all cases which disrupt do not necessarily have a postoperative complication of the afore mentioned types. In our series 10 patients had respiratory complications 3 suffered from distention 1 had ascites 1 had disruption following gastric lavage and 1 sat up on the third day to void. Thus it is probable that in 16 of our 33 cases increased intra abdominal pressure may have been an attributable cause. In this conjunction we believe that the use of duodenal suction as proposed by Wangenstein (109) and small intestinal intubation as introduced by

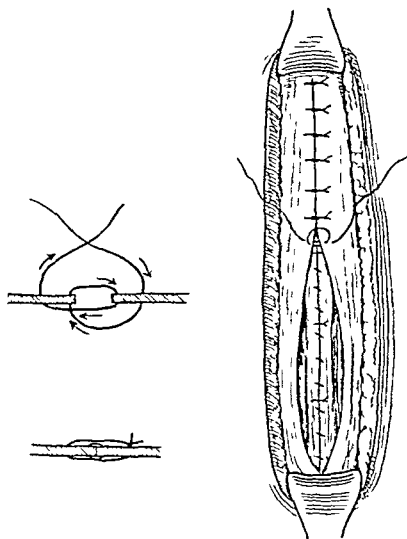


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In any case in which there is fear of a wound disruption, particular attention must be given to

the signs and symptoms of this disaster. This is of particular importance during the period from the fifth to the tenth postoperative day. Twenty six of our 33 cases presented disruption from the fifth to the ninth day, the average time was eight days. Disruption of abdominal wounds has been observed as early as the first day (34, 13) and as late as the sixtieth day. The majority of these accidents however occur from the fifth to the tenth postoperative day, the eighth day being the average (66, 97, 33, 72, 112, 28, 89). The occurrence of disruption shortly following the removal of tension sutures has been noted by several authors (94, 45, 67, 83).

The importance of recognition of an impending disruption or an actual disruption in its early stage seems obvious as repair can be performed with less possibility of contamination of the wound (36), the degree of shock is lessened and the hazard of intestinal obstruction is reduced. Usually there will be a serosanguineous discharge from the wound (67, 112, 22, 72, 33, 57, 30, 92, 104, 16, 29) and this was noted in 20 per cent of our cases, but it is our opinion that if this sign was looked for conscientiously, the percentage would be higher. Any edema or fluctuation along the line of skin incision should immediately arouse suspicion. If the patient complains of a sudden sharp pain in the region of the wound or during a fit of coughing or vomiting feels something give way (22) then the possibility of an impending disruption must be considered. Unfortunately, the symptoms may be so mild as to draw little attention to the wound. If a deep separation is suspected, it is sometimes of value to probe the wound under aseptic precautions as suggested by Lahey (62) and Clute (19). Signs of partial intestinal obstruction (99, 2) as evidenced by persistent nausea, vomiting or distention (57, 71) may be present. Thus it is evident that although impending or partial disruption may not always be definitely diagnosed, every effort should be made to recognize this condition and proceed with early and efficient treatment.

When a wound disruption is discovered, it should be the duty of the surgeon to take immediate precautions to guard against evisceration or if there is protrusion of the viscera, further prolapse should be prevented by the application of sterile dressings and external pressure with the hand or with adhesive strapping. The importance of this procedure, which of course should be done regardless of what further methods of treatment are to be used, has been emphasized by Madelung (66). It seems logical to agree with

the statement of Von Graff (36) that the sooner the disruption is recognized and proper treatment instituted, the better the chances of a favorable outcome. If the patient's condition will permit following the administration of a reasonably large dose of morphine, he should be transported to the operating room where, with the benefit of a good anesthesia, a satisfactory secondary closure may be accomplished. This procedure is in general agreement with most writers (33, 94, 78, 3, 34, 19, 47, 62, 67, 57). He should be cautioned to keep as quiet as possible; the dressings should be carefully removed and then with care not to touch the bowel, all visible surface of the abdomen should be carefully cleansed with green soap and sterile water. Further preparation of the skin is optional. The wound is then draped and the abdominal wall infiltrated with novocaine for 3 or 3 in about the incision. This is the anesthesia of choice of most surgeons (33, 94, 78, 3, 34, 19, 47, 6, 67, 13, 12, 30, 104, 10) though a few specifically state that they prefer spinal anesthesia (99, 36, 57). Protruded omentum may be ligated and excised. If the intestines have prolapsed onto the surface of the abdomen, they should be washed with saline solution and gently returned to the abdomen. The secondary closure of the abdominal wall may now be performed. It is our opinion that the type of secondary closure employed has little to do with the ultimate outcome, although immediate resuture is probably preferable when it does not jeopardize the life of the patient. Any difference in the mortality, however, is probably due to the general condition of the patient, the underlying disease and the primary operation, rather than the type of treatment instituted in the care of the evisceration. In our series of 33 cases, 13 of the wounds were closed with through and through sutures of silk worm gut or wire. Six patients died. Twelve wounds were closed in layers and tension sutures were also inserted. Seven of these patients died. In 8 cases a tampon was inserted and in 3 of these the margins of the wound were approximated over the tampon with through and through sutures. 2 patients died. Five wounds were strapped with adhesive tape over a pack and 1 of the patients died while the other 4 were later resutured with recovery.

A review of the literature reveals considerable differences of opinion as to the method of secondary closure, some stressing the importance of layer closure, others closing the incision by means of silk worm gut or wire sutures placed close and including all thicknesses of the abdominal wall. Shipley's method of closure (92)

seems to have considerable merit. He places a gauze pack over the intestines, and this is allowed to protrude through the lower margin of the wound, acting as a drain. Closely spaced interrupted sutures of No. 22 silver wire are then introduced through the entire thickness of the abdominal wall, and are secured by threading the end of the wire through a bone button and twisting on a match stick (Fig. 7). The wire lies outside the gauze pack, which serves as a protection against erosion of the bowel wall by the wire, and also prevents the coils of the intestines from protruding between the wire sutures. The edges of the wound are then approximated by tightening the wire. In infected cases a narrow strip of gauze may be placed external to the wire. As the wound edges become more healthy and granulations appear, the gauze under the wire becomes loose and is easily removed. The wires are then tightened further, and by the end of ten days all the gauze is usually out, and the wound edges are closely approximated, after which union usually takes place rather promptly by granulation.

The condition of the patient may make it inadvisable to undertake a secondary closure, because of the presence of shock which sometimes accompanies disruption, or because of the presence of a severe wound infection or general sepsis. Under these circumstances, the method of choice is packing a wound with gauze and strapping with adhesive tape. In this opinion we are in agreement with Colp (22), who states the tampon treatment is the simplest, easiest, and least shocking, and can be done with the patient in bed and without an anesthesia. The packing is gradually removed as healing proceeds, which as a rule requires about five weeks. Grace (35) and Eggers (27) agree with Colp (22), as do Eliason and McLaughlin (28), who employ secondary suture only for patients who were not particularly ill when the complication occurred. It must be remembered that the method of tampon and strapping has the drawback of prolonging the period of healing, and the possibility of the development of a fistula from pressure or obstruction must also be borne in mind. Milbert (72) stresses the fact that tampons and strapping may be used for several days until the patient's condition will permit suture, at which time it may be safely carried out. When there is a questionable obstruction, or in the presence of distention, several authors believe it advisable to perform a Witzel's enterostomy (33, 99). Horner (48) considered this inadvisable. In the case in which dilated loops make their reduction into the abdomen difficult, Pool (82) aspirates the bowel

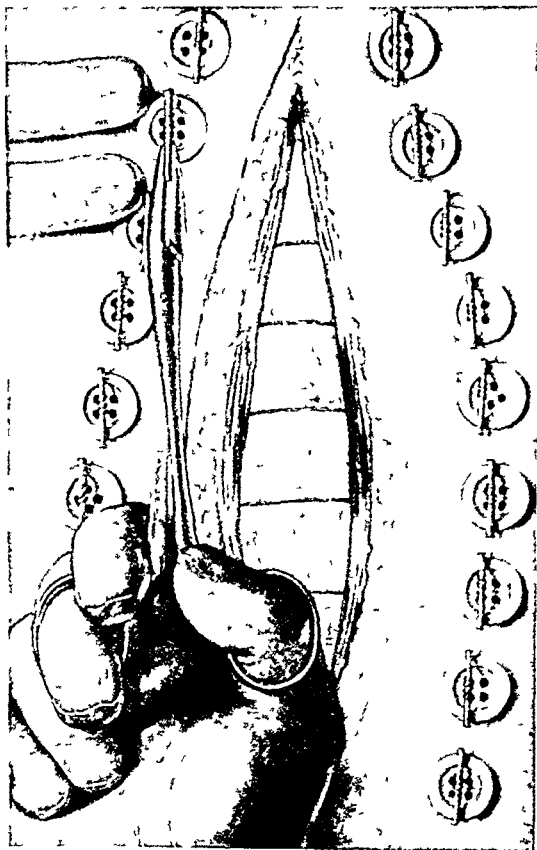


Fig. 7. In Shipley's (90) method of secondary closure of the disrupted wound, closely spaced through-and-through silver wire is inserted and is wound on matches over pearl buttons. A gauze drain of about 8 layers of gauze is placed against the intestines and allowed to protrude through the lower angle of the wound. This protects the intestines, keeps them from protruding, and acts as a drain. (*Ann Surg*, 1925, 82:452.)

content by inserting a needle through the wall of the bowel and applying suction. Horner (48) reports experiencing this difficulty in a case of recurrent evisceration, in which a tear occurred in the urinary bladder and the intestines could not be returned to the abdomen. The dilated loops were covered with a perforated rubber sheet which was sutured to the skin. Epithelization occurred later and the wound healed with a large hernia. Hernia following disruption is generally considered to be a relatively infrequent complication, regardless of the method of closure. In Sokolov's series (97) the mortality for immediate secondary closure was 32 per cent (132 of 411 cases), contrasted with a mortality of 35.49 per

cent (72 of 203 cases) in those cases in which the wound was packed and strapped

As already mentioned comparative figures regarding the mortality for the method of immediate closure and the method of tampon and strapping are likely to be misleading because the latter method has been largely used in those patients who are too ill to withstand a secondary suture

In attempting to evaluate the importance of wound disruption as a factor in the cause of death, it is immediately apparent that this cannot be done with certainty. Many of the patients are desperately ill because of the nature of the original pathological lesion and because of the operation. We are inclined to agree with Milbert (72) who points out that the disruption is often the complication of what would have been a fatal outcome in any event. It seems plausible to consider the disruption at least as a definite contributing factor but we are unable to determine from our series whether or not the fatalities resulted from the disruption alone. Not many of the major reviews have attempted to evaluate this point. Sigalas (94) however states that in 30 of 161 cases disruption was the major cause of death. Glenn and Moore (34) believed that in 10 of 22 patients dying shortly after disruption the cause of death was due to the disruption. Totten (104) states that in 9 of 19 cases the disruption was an important factor in the cause of death. A variety of conditions have been listed as the actual cause of death but many writers consider the fatal outcome to be due to peritonitis

SUMMARY

From a study of the literature on wound disruption certain points appear of importance

The reported incidence of wound disruption averages 15 per cent with a mortality of 35 per cent. The age sex and race of the patient are unimportant factors. Seasonal variation may have some bearing in so far as it predisposes to respiratory infections

The general condition of the patient and the underlying disease for which the operation is performed must be considered as important predisposing factors. Obesity anemia and concurrent systemic disease may affect the progress of wound healing. In addition there are certain less obvious factors attributable to the patient which influence wound healing. These are Vitamin C deficiency hypoproteinemia and catgut allergy.

Consensus of opinion would indicate that wound disruption is essentially a complication of the vertical incision. We cannot definitely say

whether the lower or upper abdominal wound is more prone to disrupt. We believe that any incision which seriously impairs the blood and nerve supply of the abdominal musculature is more prone to separate and also that it is more difficult to secure and maintain an accurate approximation of the transversalis fascia when its fibers are cut across. We refer mainly to those vertical incisions which split or lie lateral to the rectus muscle. We believe that the preponderance of evidence is against the use of the vertical abdominal incisions and urge a wider use of the transverse oblique muscle and fascia splitting incisions whenever possible.

We believe with the majority of writers that no method of closure or type of suture is proof against wound disruption. In clean cases the fine silk closure as described by Whipple (110) would seem to be ideal. In infected cases the use of a fine chromic catgut with the silk technique is probably as good as any procedure. The value of non absorbable tension sutures is under considerable discussion at the present time. Those who favor these sutures believe that they take the strain off the suture line and make for a stronger closure. Those against their use believe that they strangulate tissue tend to cut through cause local necrosis and often result in small stitch abscesses and wound infection.

The through and through method of closure with silver or steel wire has many adherents and is undoubtedly an excellent method of closure in infected cases and in those cases in which at the time of closure there is a possibility of disruption. We also believe that there is an additional factor of safety in the application of a good abdominal support.

Drainage through the incision probably favors disruption. It would seem logical to use a stab wound some distance from the incision when possible. If drainage of the incision is considered necessary the peritoneum should be closed and a drain placed down to it.

With but few exceptions practically every writer believes that a stormy postoperative course complicated by coughing hiccough vomiting distention and undue restlessness resulting in increased abdominal pressure predisposes to disruption.

Infection may be considered a contributing factor in wound disruption.

A sharp pain in the vicinity of the incision or a feeling of something giving way during a fit of coughing or vomiting may mean a disruption has occurred. A knuckle of bowel may protrude into the deeper layers of the incision and become

Fig 8 Disruption of an abdominal wound with evisceration, occurring in a sixty-eight-year-old male negro. The patient was thin and undernourished, but seemed to be in fair general condition. He had been suffering from severe intermittent abdominal pain for forty-eight hours prior to admission to the hospital, and a diagnosis of volvulus was made. The abdomen was opened through a mid-left paramedian incision, and a large distended volvulus of the sigmoid was encountered and was easily released. A rectal tube was inserted, and following this marked deflation of the large bowel occurred promptly.

The abdomen was closed with a continuous fine silk suture in the peritoneum and posterior fascia, interrupted silk sutures in the fascia, and 3 finesteel-wire tension sutures including the anterior rectus fascia. The skin was closed with clips. The postoperative course was uneventful. A rectal tube and gastric suction tube were inserted. There was no distention or vomiting. The nasal and rectal tubes were removed on the third postoperative day, and from then on the temperature did not mount above 100 degrees, and the pulse ranged between 70 and 80.

On the seventh postoperative day the wound was inspected. It appeared a little swollen, and it was noticed that the middle tension suture had broken. There was some bloody fluid on the dressing, and following the removal of the skin clips about 2 ft. of small bowel immediately eviscerated. The intestines were reinserted, the wound strapped, and the patient taken to the operating room. Under local novocaine infiltration, a secondary closure was performed using closely placed through-and-through stainless steel-wire sutures.

Inspection of the wound revealed it to be clean, and the margins glistening and free of exudate or granulations, without any evidence of healing. The silk stitches had cut through the tissues.

Immediately following the secondary closure, the serum-protein determination showed 56 per cent total. The

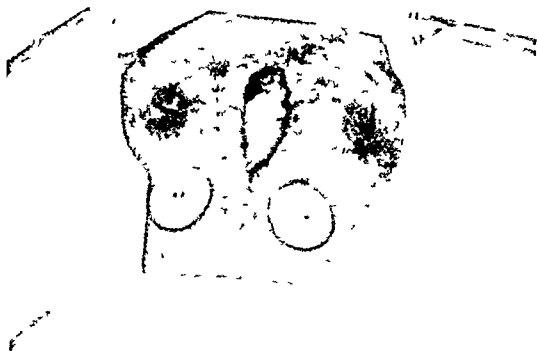


Fig 8

albumin-globulin ratio was 1:24 (normal total serum-protein determinations average about 7:1 per cent, and the albumin-globulin ratio is normally about 1:53). The ascorbic-acid determination, by the method of Pijoan and Klemperer (79), showed 13 mgm of ascorbic acid per 100 ccm of blood plasma (normals reported by their method range between 65 to 2 mgm per 100 ccm of blood plasma).

The patient was given a transfusion of 500 ccm of citrated blood and cevitamic acid. His convalescence following secondary closure was uneventful.

partially obstructed, which results in an increasing degree of vomiting and distention. Often the only sign may be serosanguineous drainage on the dressings.

The most dangerous period is from the fifth to the tenth day.

Following a disruption, it is important that a closure be effected as soon as possible. Immediate resuture is the method of choice in those clean cases in which the patients are not particularly ill. It would seem that some type of non-irritating through-and-through suture, such as steel wire, is preferable. The sutures should be closely spaced, in order to carefully approximate the peritoneum. In infected cases, or in those individuals who are gravely ill, strapping the wound with flamed adhesive tape over a gauze pack is preferable to immediate resuture.

It is impossible to estimate accurately the effect of disruption upon the mortality. Our impression would be that from one-third to one-half of the deaths occurring shortly after a disruption may be directly attributable to disruption. Peritonitis is the actual cause of death in many instances.

Why does the disrupted wound, secondarily closed, often heal so promptly? This is a difficult question, and, so far as we know, has not been positively answered. Recurrences have been reported, but they are rare. The healing of an infected wound which disrupts seems to need but little discussion. As the infection cleans up, the wound heals by granulation. However, the clean wound which separates without apparent cause and heals rapidly on resuture offers a more difficult problem. Possibly the transfusion, so frequently administered following the secondary closure, may be a factor. Possibly the actual trauma which occurs at the time of the separation and the resuture may afford sufficient stimulation to promote healing.

In attempting to outline a prophylactic régime for the prevention of wound disruption, many of the casual and predisposing factors must be given serious consideration. For the sake of brevity, we have listed below those that seem most important to us.

1. Adequate pre-operative preparation when possible, a diet rich in Vitamin C, and blood transfusions if indicated.

2 The wider use of more anatomical incisions preservation of the nerve and blood supply and avoidance when possible of the vertical incision through the tendinous attachment of the internal oblique and transversalis muscles

3 Meticulous surgical technique

4 An accurate approximation of all layers of the incision especially the peritoneal layer

5 Avoidance of the use of catgut and the wider use of silk in clean cases

6 Avoidance of drainage through the incision

7 A satisfactory anesthesia giving good relaxation

8 The use of duodenal suction and small intestinal intubation to combat vomiting and distention

9 The general use of an effective abdominal support

In concluding this review we wish to emphasize that it is difficult to evaluate the various factors concerned with wound disruption from the study of the literature. The majority of analyses of clinical cases have been made from inadequate data—a fault from which our own review suffers. Too frequently it has been necessary to study records which lack sufficient information to form satisfactory conclusions. The basic problem is one of wound healing and it is difficult to evaluate its components even when a direct attempt is made upon an individual case. If a study of a series of cases of wound disruption is to be of real value it would seem logical to attempt analysis of each case as it occurs with special emphasis on the contribution played by each of the many possible factors involved.

We wish to express our thanks to Dr Charles G. Johnston for his valuable aid and advice.

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SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Balice G Deep Hematomas and Chronic Phlegmons of the Abdominal Wall Causing Difficult Clinical Diagnosis (*I matomi e flemmoni cronici profondi della parete addominale di difficile diagnosi clinica*) *Riv di chir* 1938 4 589

Deep hematomas of the abdominal wall are usually divided into spontaneous and induced hematomas. The former occur without demonstrable cause or on the occasion of a minimal traumatism (cough) and appear nearly always in the sheath of the rectus muscle after rupture of the muscle and its vessels; the latter are caused without doubt by a traumatic lesion of the vessels. About 100 cases of spontaneous hematoma have been reported. The disorder begins like an acute abdominal disease with intense pain, abdominal tension and vomiting while a rather soft tumefaction of varying size develops on either side of the median line above the level of the arch of Douglas and within the lateral limits of the rectus muscle. All kinds of acute abdominal disorders have been erroneously diagnosed in these cases.

Balice describes 2 cases of deep hematoma of the abdominal wall due to wounding of the lower epigastric artery in the course of a surgical intervention for inguinal hernia. Very few cases of this kind have been reported. In the first case the patient felt a sudden rather acute pain in the region of the right iliac fossa eleven days after a Bassini operation; the pain soon disappeared. On the following day there was a tumefaction which was raised only slightly above the cutaneous plane; it was rather round, painless and of somewhat elastic consistency, had a diameter of about 10 cm. and was deeply seated and non adherent to the skin. Contraction of the abdominal muscles made it disappear. A neoplasm was at first suspected but upon puncture 400 c cm. of bloody fluid were delivered and the patient was well within a few days. There seems to be little doubt that trauma of a vessel during the operation had caused late hemorrhage through some mechanism difficult to explain.

In the second case the patient was admitted with the diagnosis of malignant abdominal tumor. He had been operated upon for strangulated inguinal hernia one month previously and immediately after the intervention had felt slight pain in the right lower quadrant which had reappeared at intervals of days and lasted only a few minutes each time. The same symptoms were found as in the first case but the tumefaction although slightly movable transversally was absolutely immovable longitudinally. Median subumbilical laparotomy disclosed a hematoma and the patient was soon discharged as cured. In this case also the hematoma was ascribed to injury of an epigastric vessel.

Deep chronic phlegmon of the abdominal wall is often mistaken for a malignant tumor because usually there is nearly complete absence of fever; the patient's general condition is bad, the course of the disorder is protracted and the physical signs are deceptive. Generally the morbid process originates in the lymph nodes which accompany the epigastric vessels in the suprapubic space or in the deeper lymph nodes of the prevesical space of Retzius but phlegmon may develop also in the properitoneal connective tissue which through peritoneal adhesions may be in contact with infected abdominal viscera. A case in point is that of a man who was admitted with the diagnosis of malignant abdominal tumor of rather rapid course in whom a suprapubic hard mass extended laterally toward the inguinal arches. The mass was almost painless, non adherent to the skin and immovable. The patient had no fever and was in a debilitated condition. These symptoms and a gonorrheal history of twenty years raised the suspicion of chronic phlegmon which was confirmed by puncture.

RICHARD KEMEL M D

GASTRO INTESTINAL TRACT

Borst J G G The Cause of Hyperchloremia and Hyperazotemia in Patients with Recurrent Massive Hemorrhage from Peptic Ulcer *Acta med Scand* 1938 97 68

The literature of 1934 and 1935 contained reports of an increase in urea in the blood in most of the patients having had gross bleeding into the digestive tract. In some of the cases this azotemia was so marked that it must have had a deleterious effect on the course of the disease. The factors involved in the causation of this hyperazotemia have not been understood. Some investigators believe that the blood liberated in the intestinal tract is the source of the urea formed. Others believe the urea is due to irritation secondary to dehydration or deficiency of chlorides in the body which interfered with proper functioning of the kidneys. Still others believe that the toxic destruction of the body proteins plays the most important rôle.

Christiansen directed attention to the low chloride content of the urine and advanced the hypothesis that the symptoms of intoxication were due partly to demineralization. Borst and his co workers in Amsterdam found that most of the bleeding patients with marked azotemia also have a hyperchloremia and at the same time an extremely low sodium chloride excretion in the urine. The administration of sodium chloride would elevate the sodium and chloride content of the blood but it did not lead to an increase in the sodium chloride excretion in the urine.

During the past few years these investigators have been studying the excretion of sodium and

chloride in a large group of patients, from which study they have been able to conclude that very rarely an increase of sodium and chloride occurs in the blood accompanied by an almost complete absence of these minerals in the urine. Those cases in which it occurred had possibly one condition in common, namely, an insufficient filling of the blood vessels, or at least of the arterial system, since it was present in cases of severe hemorrhage, dehydration, nephrotic edema, postoperative shock, and in some cases of heart failure.

In order to better understand the cause of this hyperazotemia and hyperchloremia, an extensive study was made of all patients suffering from recurrent massive gastric hemorrhages. For several days the urea content of the blood and the excretion of urea plus ammonia were studied, also the formation of urea and ammonia, and the urea clearance were calculated. An attempt was made to find the cause of the sodium-chloride retention by measurement over a definite period of the intake and output of sodium chloride and comparison of the results with the course of the sodium chloride and the HCO_3 content of the blood plasma. For the sake of comparison the fate of the potassium within the body was also studied. The percentage of hemoglobin was repeatedly estimated and, finally, in order to calculate the colloidal osmotic pressure of the serum, frequent estimations were made of its albumin and globulin content.

Three cases in which all of this was done are reported in detail, with the findings graphed in a most interesting and valuable fashion. A study of these patients developed interesting findings. All patients showed a hyperazotemia. The urea clearance always dropped in the period of shock. Following hemorrhage the circulating blood tends to restore its volume from the extracellular fluids, which means blood dilution, and during this time neither sodium nor chlorides are excreted by the kidneys. This retention of sodium chloride is therefore part of the regulating mechanism established for the purpose of restoring the normal filling of the arterial system from the extracellular fluid. Mechanisms of this type probably occur in all situations in which the arterial system is incompletely filled. The hyperazotemia apparently is secondary to an increased urea formation from retained blood within the bowel, and should the patient be insufficiently fed, metabolism of the body proteins takes place since the blood within the bowel serves as a source of nourishment.

On the basis of all this data on patients with massive hemorrhage, Borst recommends the following treatment:

Following massive hemorrhage an effort must be made to restore the quantity of circulating blood by (1) restoration of the loss of erythrocytes and plasma protein through drip transfusion, and (2) administration of fluids until the urea concentration of the urine drops below maximum and the chloride content rises. Salt may be given only when the

sodium-chloride content of the blood plasma is not elevated, but carbohydrates should be administered as soon as possible to prevent body-protein destruction through inanition. In the presence of vomiting or gastric retention 5 per cent glucose is administered subcutaneously, otherwise a 10 per cent cane-sugar mixture with a few drops of orange juice should be administered by mouth. This latter therapy is usually well tolerated.

SAMUEL J. FOGELSON, M.D.

Høyer, A. • The Roentgen Diagnosis of Intestinal Obstruction. *Acta radiol.*, 1938, 19: 409

The author reviews his findings following a laboratory and physical examination of patients with intestinal obstruction. It is observed that the roentgen diagnosis of obstruction of the small intestine is based on the formation of a fluid level in the distended gut due to the presence of gas and thin intestinal contents. Fluid levels are found normally in the stomach and in the superior portion of the duodenum, and occasionally in the terminal coil of the ileum. In meteorism, the gas content of the large intestine is increased, and the small intestine may be more or less gas-filled. The conditions which most frequently give rise to meteorism are fermentative dyspepsia, renal colic, biliary lithiasis, acute pancreatitis, intra-abdominal tumors, and cardiac failure.

When there is an obstruction in the small intestine, the immediate result will be an accumulation of thin intestinal contents in an oral direction, while the intestine distal to the occlusion is more or less completely emptied. Following this there is an abnormal fermentation of stagnant intestinal contents with the development of gas and the formation of fluid levels, which, according to Kloiber, commences two or three hours after the onset of the attack. The length of the fluid level varies according to the course of the bowel. The surface of the fluid has a concave shape. The higher the obstruction, the fewer the fluid levels, the lower the obstruction, the greater the number and the more lowly situated the fluid levels. The increased fluid content of the prestenotic segments of the intestine produces an increased general density which is more pronounced in the lower portion of the abdomen because of the fact that the fluid-filled intestines are low, while the gas-filled portions rise. When ascites is present also, the density of the lower abdomen is then increased further. The coil of the intestine lying immediately proximal to the obstruction, the so-called prestenotic coil, rises in the abdomen in the form of a reversed U. A roentgenological symptom which the author believes to be of the greatest importance in diagnosis is the more or less complete absence of gas in the large intestine in the case of obstruction in the small intestine. A roentgenogram which demonstrates fluid in dilated coils of the small bowel is considered by most authors to be pathognomonic of obstruction.

Obstruction of the large intestine is distinguished by distention and the formation of a fluid level in

the part of the large intestine proximal to the obstruction. If the obstruction is complete the distention may become enormous. At the beginning of obstruction of the large intestine there are no demonstrable roentgenological changes in the small intestine. Not until a large bowel obstruction has been present for a considerable time does the x ray evidence of ileus spread to the small intestine as well. This is also the case if there is a simultaneous peritonitis.

The earliest diagnosis of intestinal obstruction in the cases studied by the author was made nine hours after the onset of the attack. Although the roentgenological changes were vague they were sufficiently distinct to permit the diagnosis of small bowel obstruction.

From January 1 1933 to April 16 1938 the author studied the cases of 26 patients with intestinal obstruction 21 of whom were examined roentgenologically. Twenty three patients were operated upon 3 were discharged as cured without operation and 3 died. The total mortality was 11.5 per cent the mortality in the operative cases being 13 per cent. In a period of eleven and one half years from 1924 to 1936 116 patients with intestinal obstruction were treated in the same hospital. The total mortality in this group was 39 per cent the mortality in the operative cases being 38 per cent. Although it is difficult to compare series which vary so greatly in number it is evident that the mortality from intestinal obstruction at Aker Municipal Hospital decreased remarkably subsequent to the routine adoption of roentgen examination in cases of suspected intestinal obstruction.

The technique of examination as used by the author is simple. The patient is placed in the erect position as for a gastric examination if he is too ill to assume the erect position a lateral recumbent exposure is made preferably in the right lateral position. A Lysholm grid is used care being taken that the stripes are placed vertically since horizontal stripes on the roentgenogram may form false fluid level. As a rule the survey film taken in the erect position has been sufficient but in a number of cases supplementary exposures have been made in the lateral and oblique erect position as well as in the supine position. In 2 cases a barium enema was also given. In no case was barium given by mouth. The author reports a number of cases with reproductions of the films.

HAROLD C. OCHSNER, M.D.

Bottin J. The Treatment of Intestinal Obstruction. *Arch. Surg.* 1938 37 735.

It has been stated that since the beginning of the century the mortality from intestinal obstruction has remained at about 40 per cent. The knowledge acquired in this field as a result of animal experimentation has not been applied sufficiently to therapy. The author wishes to emphasize particularly that obstruction is rarely a disease *per se*. It is the result of a pre-existing condition or a malformation or the cause may remain obscure. In all

cases the obstruction aggravates the original condition. One must forget the immediate or remote cause of the obstruction and utilize all efforts to relieve the obstruction at the earliest possible time.

The influence of the French and German contributions resulted in the concept that intestinal obstruction produces intoxications of various kinds. Since 1912 the American school represented by Hartwell and Hoguet and later by Haden and Orr has changed this point of view. For these men regard death following intestinal obstruction as being due primarily to anhydremia and hypochloremia. A tendency to ignore the toxic factor of the problem has developed. The author believes that intestinal obstruction produces an intoxication first of the blood and then of the tissues. In addition to this *toxaemia* there develops dehydration and demineralization of the blood and tissues. These factors alone may account largely for the particular toxemia to the exclusion of the obstructed intestine. Dehydration and demineralization result in a reduction of the blood volume and blood pressure in consequence of which there are changes in the tissue circulation of a type which permit the cellular metabolites (some of which are highly toxic) to be imperfectly removed from the blood stream. There is a diminished excretion of urine and tissue intoxication occurs. The gravity of the height of the obstruction is not to be ignored.

Certain principles in the treatment of intestinal obstruction are fundamental. If the patient's condition is not too grave it may be advisable to postpone operation for several hours in order to restore water and minerals that have been lost. This treatment consists in furnishing the body with water in large quantities and with simple ions particularly chloride sodium potassium and calcium in an isotonic or mildly hypertonic solution. Local or regional anesthesia are best but spinal anesthesia may be indicated in certain cases.

An essential of the surgical treatment of intestinal obstruction is always to practice the simplest kind of procedure. It is the obstruction that must always be treated. It alone constitutes the emergency. The aim of all treatment is to remove the obstruction by the simplest means. Experience teaches that frequently a simple operation will save a life and will permit later and safer treatment of the causative lesion. A complicated operation may relieve the obstruction but will result in a large number of fatalities. If one attempts resection and suture of the obstructed bowel one must expect some disagreeable complications to ensue. No tissue is less suitable for suture than the obstructed bowel.

The postoperative treatment is most important. Rehydration and remineralization must be accomplished by means of fusions or injections of large amounts of isotonic or mildly hypertonic solutions of chloride sodium potassium and calcium. Gastric lavage or better duodenal suction by the Wangenstein method is excellent for removing the toxic material from the stomach and small bowel.

The author reports 55 fatalities among 302 patients who were operated upon for mechanical obstruction of the bowel, a percentage mortality of 18.25, which is relatively small. The cause of death in the majority of instances was not the obstruction. All but 4 or 5 patients in this series were relieved of their obstruction during the course of the operation. The safety of the patient lies in the less complicated and most simple procedures. The surgeon's first concern must be to save the patient's life.

Postoperative ileus is a peculiar and particular form of ileus, either paralytic or spastic, which may follow any operative intervention, but most frequently follows an abdominal operation. Postoperative obstruction dependent upon a more or less severe peritoneal infection belongs in the domain of the functional type of obstruction consecutive to peritonitis. The author refers here to postoperative ileus without any sign of peritoneal reaction. The cause of paralytic ileus remains unknown. For its treatment, the writer uses gastric lavage, duodenal suction, hot applications to the abdomen, and hot and cold enemata. At best, the results are most uncertain. One may employ certain pharmaceutical products, such as posterior pituitary extract, peristaltin, acetylcholine, and physostigmine. In some of the author's cases, treatment was followed by the passage of gas and feces, while in the majority of cases the drug proved inefficacious. Morphine has been advocated in recent years to re-establish intestinal peristalsis. This therapy has not given the results expected of it in the author's hands. Lenche advocates the use of spinal anesthesia in paralytic ileus, and the method has been rapidly popularized. Some patients have a prompt evacuation shortly after the injection, but such a result is not always to be expected. It is essential to use caution, since the method may result in regrettable accidents.

In conclusion the author states that some of the methods used for the treatment of postoperative ileus are not applicable if the intestinal paralysis is due to an inflammatory peritoneal exudate which should not be spread by increased peristalsis. It may be wise to splint the bowel with morphine in order to localize the infection. The author considers the most effective therapy against postoperative ileus to be the replacement of large quantities of fluids and minerals. Blood transfusion also is valuable at times. Of all the therapeutic measures in the treatment of intestinal obstruction, rehydration and remineralization give the most satisfactory results. In certain cases, all methods of treatment employed have failed to save the patient. In such instances the performance of simple enterostomy may have a place.

JOHN W. NUZUM, M.D.

Niosi Cusimano, G. **Intestinal Occlusion and Appendicitis** (Occlusione intestinale e appendicite). *Minerva med.*, 1938, 29: 593.

Niosi Cusimano reports 8 cases of mechanical intestinal occlusion due to appendicitis. These occlu-

sions may occur during the evolution of an appendicitis which is or is not complicated by a localized or diffuse peritonitis (5 cases), after an appendectomy (early or late postoperative occlusion, 3 cases), or some time after an appendicitis that has been medically cured or become chronic. In the first group, 4 cases were complicated by peritonitis, in the second group, 1 case occurred three months after the appendectomy and the 2 other cases were represented by 1 patient who again had an obstruction after an interval of ten years.

In cases in which the occlusion occurs after the operation, drainage has been inculcated as the primary cause of the accident. Undoubtedly, the influence of drainage has been grossly exaggerated and the occlusions should be attributed largely to peritonitis with its consequences. The frequency of occlusion due to appendicitis in the author's material has been 0.88 per cent, although other statistics give higher figures. The symptoms and diagnosis of these occlusions do not differ from those of occlusions from other causes, and an attentive observer usually discovers the mechanical obstacle when it is present. In addition, mechanical occlusion runs a progressive tumultuous course which rapidly alters the general condition of the patient, paralytic ileus, on the other hand, remains stationary and often regresses spontaneously.

The ideal treatment consists in the removal of the obstacle through ample laparotomy and the re-establishment of the natural canalization of the intestine. However, in cases of stercoremia, the immediate intervention is limited to enterostomy cephalad to and not far from the obstacle, and the radical operation is deferred until the general condition of the patient is more favorable. In cases of postoperative occlusion, a median sub-umbilical incision allows excellent exploration for removal of the obstacle, when there is danger of the re-formation of adhesions or when removal of the adhesions is considered questionable, entero-entero-anastomosis (usually an ileotransverso-anastomosis) is indicated. In cases of pre-operative occlusion diagnosed early, the same incision serves the purpose, but the intervention is complicated by the necessity of attending also to the appendix and to a possible abscess. Exceptionally, it may be necessary to excise a portion of the intestine. The second stage of the radical treatment in postoperative occlusions is identical to that of the first stage of radical treatment, but there is no fixed rule in the case of pre-operative occlusions, and the surgeon must be guided by circumstances.

The medical measures to be taken in any case of occlusion include pre-operative lavage of the stomach, the pre-operative and postoperative hypodermic and rectal administration of physiological salt solution, the intravenous injection of hypertonic salt solution (from 15 to 20 gm. of salt every twenty-four hours), and cardiac stimulation.

Of the 8 patients, 5 were cured and 3 died, 2 deaths are attributed to the abscess that complicated the appendicitis, and 1 death occurred in a woman, aged

seventy three years who developed peritonitis. The prophylaxis of occlusion consists of early operation of the appendicitis within the first twenty four to thirty six hours, perhaps even within the first forty eight hours. The diagnosis of acute appendicitis is rarely difficult and errors may be avoided by a complete clinical and laboratory examination. Diagnostic errors are especially likely to be made in the case of children in whom pneumonia or diaphragmatic pleurisy may cause pain in the region of the appendix or pneumococcal peritonitis may raise the suspicion of appendicitis complicated by peritonitis.

RICHARD KEMEL M.D.

LIVER GALL BLADDER PANCREAS AND SPLEEN

Cole W. H. and Rossiter L. J. The Relationship of Lesions of the Cystic Duct to Gall Bladder Disease. *Am J Digest Dis* 1938 5 576

In a series of cases of gall bladder disease the authors noted that not infrequently the fundus of the gall bladder which had been removed showed very little if any evidence of disease but the pathological changes observed in the cystic duct were sufficient to explain the gall bladder symptoms. Most of these lesions in the cystic duct were of the type capable of producing obstruction of the duct especially if a local temporary disease produced edema at that point. Many such lesions cannot be identified until after cholecystectomy when the cystic duct can be opened. If the symptoms are caused by lesions of the cystic duct cholecystectomy will relieve the patient however in at least one type of biliary dyskinesia such a procedure is not likely to alleviate the symptoms.

The cystic duct is subject to many variations and anomalies as are the valves of Heister. Normal valves of Heister do not offer significant obstruction to the flow of bile into or out of the gall bladder. Inflammatory or congenital lesions of these valves may offer a certain amount of resistance to the flow of bile through the cystic duct particularly if such impingement is increased by an acute inflammatory reaction in this area. Obviously prolonged obstruction of the duct from any cause will produce by drops or empyema of the gall bladder. The authors point to the frequency of congenital lesions of the cystic duct that do not produce symptoms until late adult life when inflammatory processes are most likely to be superimposed. Repeated inflammatory processes may lead to scarring with permanent partial obstruction of the duct.

Partial obstruction of the cystic duct of a gall bladder the wall of which is sufficiently normal to concentrate bile will be more apparent as the thin fluid bile may pass freely into the gall bladder but the more viscous concentrated bile will pass less readily from the gall bladder through the partially obstructed cystic duct. In the authors series of patients the pain was most severe in those with gall bladders which filled and concentrated the bile but

in which emptying was delayed as demonstrated by cholecystograms. Therefore they attach a new possible significance to a delayed emptying time of the gall bladder following a fatty meal as observed during cholecystography.

The authors discuss obstructive lesions of the cystic duct under eight main heads: (1) stenosis due to extrinsic adhesions (2) stenosis due to a thickened wall (3) congenital or inflammatory twists or kinks (4) congenital or inflammatory lesions involving the valves of Heister (5) stone in the duct (6) tension induced by an enlarged liver (7) compression due to tumor or lymph nodes and (8) obstruction due to an anomalous hepatic or cystic artery.

The authors report the cases of 7 patients operated upon for gall bladder disease in whom the major portion of the significant lesion was in the cystic duct. In 3 patients normal filling and concentration was observed in the cholecystogram but a delayed emptying time followed the fatty meal. In 4 patients no shadow was observed during cholecystography. All 7 patients are free of their symptoms but all operations have been so recent that the permanency of the cure cannot be determined.

EARL O. LATIMER M.D.

Canónico A. N. Experimental Obstruction of the Common Duct and Decompression of the Obstructed Biliary System (Obstrucción coledociana experimental y de compresión del sistema biliar obstruido). *Boletín de la clin. quir. Univ. de Buenos Aires* 1938 14 1309

Clinical observations on patients with obstructive jaundice frequently disclose differences between various organic reactions before and during the surgical drainage of bile. These circumstances induced the author to study experimentally the effects of decompression of the biliary system. A total or partial obstruction of the common duct was produced in dogs by means of Goldblatt's clamp or rubber bands and either a rapid or a slow decompression was instituted. In addition to the quantitative and qualitative determinations of bilirubin in the blood and urine various organs such as the liver, kidneys, pancreas, intestines, spleen, muscles, heart, eyeballs and skin were studied histologically. Particular attention was paid also to the glycogen content of the liver.

A decompression of the biliary system after a previous obstruction of the common duct create in the dog liver a marked disorganization of the histological structure. A congestion of the blood capillaries may produce hemorrhages while epithelial cells become detached from the trabeculae and undergo a necrosis. The longer the duration of the obstructive period the more pronounced the alteration.

A slow decompression of the partially or completely obstructed biliary system does not produce such pronounced disturbances. The afore mentioned intrahepatic changes are attributable to the rapid fall of the biliary pressure and a concurrent increase

of the blood pressure. The glycogen content of the liver is closely related to the biological changes in the liver cells provoked by the rapid or slow decompression of the biliary system.

A rapid decompression produces degenerative changes also in the kidneys. The author's experiments furnish an anatomicopathological proof of the existence of the hepatorenal syndrome following a decompression of the obstructed biliary tree. An obstruction of the common duct causes first changes in the liver, then alterations of other important parenchymatous organs. A biliary obstruction of a non-infectious origin thus creates a decidedly toxic-degenerative condition with a progressive evolution. Not only the liver, but also the central nervous system, myocardium, and suprarenal glands may suffer. Not a rapid but a gradual decompression of the biliary system should be employed in order to minimize the undesirable effect on the liver. For this purpose the technique described by Ravdin and Frazier may be employed. JOSEPH K. NARAT, M.D.

Poetz, P. The Importance of the Lymph Glands About the Common Duct as a Cause of Biliary Stasis (Die Bedeutung der Lymphdruesen am Ductus choledochus als Ursache der Gallenstauung). Giessen Dissertation, 1938.

Pathologically altered lymph nodes may cause biliary stasis by compression of the common duct, but the author found only 30 cases of this kind in the literature. Examination of the records of 7,000 operations on the biliary tract performed in the Surgical Department of the University of Giessen revealed 58 cases of enlarged glands surrounding the common duct. The anatomy of the lymphatic system of this region is discussed. Four cases taken from the literature are cited in which jaundice was caused by swelling of the lymph glands and compression of the common duct. Tuberculosis or simple hyperplasia may cause glandular enlargement.

In many cases the cause is not clear. In this article 15 cases belonging to this group are discussed. In the literature tuberculosis is regarded as the etiologic factor in one-third of the cases, but the author found only 4 cases in his series of 58 in which this was true. Other causes were grippe (1 case), probably delivery (4 cases), ulcer of the stomach or duodenum (7 cases), and carcinoma with lymph-node metastasis (9 cases). Non-specific lymphadenitis was found most frequently, which is in accordance with data found in the literature. In 72 per cent of the cases the author found an associated cholelithiasis. In 50 per cent of the cases changes were found in the pancreas (induration and enlargement of the head), but it is possible that in these cases a lymphangitis pancreatica (Arnsperger) rather than a real pancreatitis existed. Jaundice was caused by the glandular enlargement in 78 per cent of the cases. The disease picture is variable: intermittent colic and jaundice, a persistent sensation of pressure in the right upper quadrant usually resembling the symptoms of cholelithiasis. In some cases the pic-

ture was more that of a tumor occluding the common duct with increasing jaundice and pruritus but without pain (1 case). There are also cases which in the beginning present gastric pain and later develop colic, with or without jaundice. In none of the cases could the exact diagnosis be established before operation, either by clinical or chemical means. Cholelithiasis or neoplasm of the biliary tract was the pre-operative diagnosis in all cases. From a differential diagnostic viewpoint it is important to note that the patients are usually in a younger age group, between twenty and forty years of age, and most frequently between twenty and thirty years of age. The author found that 82.7 per cent were females and 17.3 per cent were males. When the glandular enlargement is not too extensive and stones are present at the same time the diagnosis at operation may be difficult.

The ideal treatment is radical removal of the involved lymph nodes. If this is impossible, the bile should be drained into the intestine by the various procedures. Jean advocates the removal of the gall bladder in all cases, particularly when it is diseased primarily and if it is the cause of the glandular enlargement. Roeden advises the removal of the gall bladder only in those cases in which it shows marked inflammatory changes. The type of operation, therefore, must be determined according to the findings. If malignant involvement has caused glandular swelling a short circuiting operation should always be performed. In the author's cases the gall bladder had been removed in 67 per cent, but removal was not always absolutely indicated. The mortality was 6.9 per cent, due mainly to circulatory failure. During operation upon jaundiced patients it is important to determine the presence or absence of enlarged nodes, which in some cases may be the sole cause of the jaundice.

(RINTELEN) JOHN A. GIUS, M.D.

MISCELLANEOUS

Wakeley, C. P. G. Obturator Hernia: Its Etiology, Incidence, and Treatment, with 2 Personal Operative Cases. *Brit J Surg*, 1939, 26: 515.

More than 400 cases of obturator hernia have been reported. The author adds 2 detailed case reports with a description of several museum specimens. The anatomy of the obturator region is discussed and illustrated. This condition is most commonly found in elderly females, although it has been recorded in patients as young as twelve years of age. Anything that increases abdominal pressure, such as pregnancy, chronic prostatitis, and chronic constipation, may be the cause of it.

The signs and symptoms of obturator hernia are not constant. The most common symptom is the result of pressure on the obturator nerve. This is due to the fact that the obturator nerve is infringed upon by the hernial sac (Fig. 1). When the pain is referred to the knee in an elderly female it is often mistaken for chronic arthritis. Vaginal examination

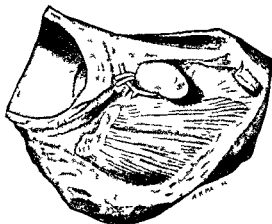


FIG. 1. Obturator hernia (Specimen 6,871 in R. C. S. Museum)

may show a tender mass in the region of the obturator foramen (Fig. 2). The diagnosis of obturator hernia should be considered in elderly females, who complain of vague abdominal pain associated with intermittent pain in the muscles of the thigh.

The abdomen is opened through a low abdominal paramedian incision with the patient in the Tren-

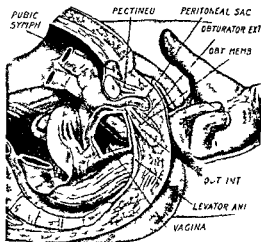
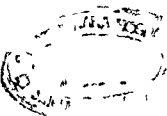


FIG. 2. Drawing showing the relations of an obturator hernia and how a vaginal examination may aid diagnosis.

delenburg position. If it is necessary to incise the fibrous ring of the sac, care should be taken that division of the obturator vessel and nerves is avoided. The sac is inverted and securely closed.

ROBERT ZOLLINGER, M.D.



GYNECOLOGY

UTERUS

Baer, J L The Cervix Uteri in Obstetrics and Gynecology *J Am M Ass*, 1938, 111 2357

The interlocking pathology and the principles of treatment of the cervix uteri demonstrate well the unity between obstetrics and gynecology. The cervix is not merely an appendage protruding into the vagina. It is a distinct structural and functional entity. Its disorders may be related to its rôle in obstetrics or gynecology, or in both. This concept is vital to intelligent treatment.

The cervix is the conic or cylindrical termination of the uterus, usually 3 cm long. Of this two-thirds protrudes into the vagina, the portio vaginalis, and one-third is the so-called supravaginal portion.

The structure of the cervix, unlike that of the muscular corpus uteri, contains little muscle but much connective and elastic tissue. It is comparatively firm and unyielding. The superior end, the isthmus, is more muscular, like the corpus, but somewhat softer. This gives it the effect of a double hinge, which permits of ready backward and forward displacement of the corpus in the pelvic cavity. Whoever practices obstetrics must be familiar with the remarkable softening of the zone between the corpus and the portio in early pregnancy, the "Hegar sign." In late pregnancy and labor there appears the striking phenomenon of formation of the "lower uterine segment," that thinned-out zone between the contractile corpus and the dilating cervix. These alterations involve the same segment of the uterus, the isthmus uteri.

The cervical canal extends from the external os to the anatomical internal os, is narrowest at these two points, averaging 4 mm in diameter, and is slightly spindle-shaped, averaging 7 mm transversely at its widest point. In the formation of the cervix, the anterior and posterior walls are the stoutest. This becomes striking on examination of the post-partum cervix, and after involution the canal is found to be much wider as a result of the yielding and overstretching of the lateral walls. Histologically, the lining membrane of the cervix is characterized by the presence of mucus-secreting glands which point downward and toward the canal and by the absence of cilia. The mucosa of the isthmus resembles that of the corpus. It can be distinguished by the direction of the glands. Those of the corpus point downward and toward the cavity and those of the isthmus upward and away from the canal.

The most striking histological fact in connection with the cervix deals with the changes at the external os. The forward and backward interplay between the cuboidal cervical mucosa and the squamous epithelium covering the portio, with the external os as the prize, begins in fetal life. At the

seventh month the canal of the cervix is lined by squamous epithelium. At birth the endocervix has pushed back the squamous epithelium beyond the external os and onto the portio in approximately 30 per cent of female infants, the so-called congenital pseudo-erosion. Within the first year of life in most of these infants, the squamous epithelium acquires the mastery and the external os becomes the dividing line. Again at puberty a secondary physiological pseudo-erosion may occur, which likewise tends to recede. This struggle continues throughout life.

In adolescence and maturity the epithelium covering the portio is subjected to the hypersecretions of the cervix which accompany certain constitutional diseases and to the irritation of cervical discharges due to inflammation. In either case, the squamous epithelium is macerated, and the red mucus-secreting endocervix advances to erosion, which may be small and superficial, or huge, furrowed, and even papillary. Lastly, the cervix, which has been traumatized in labor, heals with gaping, gradual eversion, ectropion, and erosion.

Postmenopausal atrophy of the corpus and cervix uteri is effected by two distinct influences. Atrophy of the corpus and its endometrium results from disappearance of the ovarian stimulus. Diminished circulation produces gradual atrophy of the cervix but to a much smaller degree than the shrinkage of the corpus. The endocervix retains its mature form and function (vaginal lubrication), since the cervix is not under the direct influence of the ovarian stimulus.

Fertilization, pregnancy, and labor proceed normally only when all the organs involved are normal in structure and function. For fertilization the cervix should point posteriorly at right angles to the vaginal axis. Retroflexion, retroversion, and prolapse may render fertilization difficult or impossible.

The persistence of congenital pseudo-erosion or the development of pseudo-erosion after puberty, the erosion produced by inflammatory destruction of the epithelium covering the portio, and its replacement by the endocervical epithelium, cervical laceration in labor with resultant eversion and erosion formation, all act as more or less insurmountable barriers to fertilization.

Endocervicitis not infrequently converts the normal alkaline cervical secretion to an acid secretion repellant to the spermatozoa. An endocervicitis may be the starting point of a puerperal infection with its chain of sequelæ.

When pregnancy has been established, the cervix becomes increasingly important. It is the living barrier and barricade. It locks the developing fetus and its protective fluid chamber within the corpus cavity. It absorbs the shock of impact which may accompany coitus. It accumulates the mucus

which is no longer carried out with the menstrual flow and so provides an effective plug against bacterial invasion of the corpus cavity. If now the cervix is too short whether congenitally or because of operative or traumatic destruction or if previous trauma in labor has left it gaping widely it is easy to understand how abortion may ensue.

Chronic infection of the cervix in the presence of pregnancy has heretofore received little attention. The fear of producing abortion has kept physicians from attempting any direct attack upon the lesion.

Effacement of the cervix that is the shortening of the long axis and its eventual merging into the lower uterine segment may begin weeks before the onset of labor. Dilatation of the external os usually follows the dilatation of the cervical canal. The external os may persist as a pinhole sized os (conglutination) after the cervix is completely effaced and the lower uterine segment is well thinned out. This condition may simulate complete dilatation on rectal examination and may result in application of the forceps to the head the blades being forced through the uterine cap with inevitable severe injury.

When the cervix has been lacerated in previous labor the external os is no longer a dimple or slit but is a widely gaping orifice bordered by more or less hypertrophied everted anterior and posterior lips with scar tissue in the lateral angles. This type of multiparous cervix is responsible for precipitate labor for extensive additional cervical lacerations if the patient is permitted to bear down before dilatation is complete and for incarceration of the edematous anterior lip between the head and the symphysis which unless released by upward dislodgment may prevent delivery and result in necrosis or avulsion of the incarcerated cervix. In this connection it is interesting to note that there are 17 recorded instances of spontaneous annular amputation of the cervix in labor.

Inspection of the cervix immediately after delivery reveals a massive organ hanging loosely in the upper part of the vagina. The anterior and posterior segments are heavy while the lateral zones are markedly thinned out. Lacerations when present are usually in the thin lateral walls of the cervix. The distance from the external os to the top of the vagina at this time is approximately 10 cm. A tear of 2 cm in the lateral zone will when involution is completed be nothing more than a physiological nick at the external os. Moreover attempted suture of these thin edges is usually only a gesture. The patient in whom labor has progressed spontaneously and normally to complete effacement and dilatation with subsequent advance of the head to the pelvic floor rarely sustains a major injury of the cervix. Major injuries should be repaired promptly.

When injury is suspected because of operative procedures and inspection reveals a laceration exceeding 2 cm repair should be carried out with loosely tied interrupted catgut sutures the first being placed above the angle of the tear. For

cervical bleeding one or more sutures may need to be tied more tightly. Repair of old cervical injuries at the time of subsequent delivery is not advisable. The risk of creating a focus of infection is greater than the alleged advantage of sparing the patient a subsequent hospitalization.

Operative correction of cervical pathological conditions varies with the lesion and the desired objective. Certain underlying principles may be enunciated. Simple birth injuries which are symptomless and are not accompanied by inflammatory changes require no treatment. If the patient is to retain her childbearing capacity birth injuries requiring attention must be repaired in such a manner as to avoid undue foreshortening of the cervix. If this is not an objective other types of repair are available in which preservation of the proper length of the cervix and endocervix is no longer necessary. If the lesion is essentially the result of inflammatory changes with the development of multiple cysts and fibroid erosions the cautery is adequate. For deep laceration with heavy scar formation excision and approximation are indicated. If there is gross involvement of the endocervix as well as multiple cyst formation on the portio the Sturmdorf operation (cone shaped excision with utilization of the portio as a new lining for the canal) is excellent. For simple hypertrophy and elongation low or high amputation is selected in accordance with the patient's wishes concerning pregnancy.

Benign tumors of the cervix though infrequent are usually fibromyomas. The accepted treatment is enucleation. In this connection a word of caution is advisable. Many patients with this type of growth are anemic because of protracted menstrual bleeding with resultant lowered resistance to infection. The cervix is richly supplied with lymphatic vessels which drain into the broad ligaments. Death from sepsis may follow simple enucleation of such a tumor of the cervix. The patient should be prepared by a preliminary blood transfusion and the field of operation should receive the most scrupulous pre-operative preparation.

Carcinoma of the cervix holds first rank among all the obstetrical and gynecological causes of death. Hinselmann's colposcope was devised to reveal tiny lesions of the cervix which might be incipient carcinoma and promptly citable. Schiller's iodine test was aimed at the same objective. Each of these devices to be effective must be used as a routine with biopsy of any suspicious areas. When the microscopic picture is clearcut the lesion is usually one which should have aroused suspicion without either one of these aids. Other specimens studied because they do not take up iodine may show what Schiller called the pre-invasive stage of carcinoma. Unfortunately this classification is not generally accepted by pathologists. Baer found the colposcope unnecessary and the iodine test inadequate.

The menace of the cervical stump after subtotal hysterectomy has been a source of some concern and an argument in favor of routine total hysterectomy.

tomy The Mayos have regarded it as a potential focus of infection resulting in keratitis, iritis, and arthritis of the small joints. If this were so, although atrophy is the common fate of the stump, the source of infection could readily be eradicated by vigorous use of the cautery.

It has been the aim throughout this brief analysis to convey the picture of a structure which, though a part of the uterus, is as distinct from it in function, pathology, and treatment as the hypophysis is from the brain. The full significance of this picture is best understood when viewed through a binocular, one side labeled obstetrics and the other gynecology.

J THORNWELL WITHERSPOON, M D

Stevenson, C S Tuberculosis of the Cervix *Am J Obst & Gynec*, 1938, 36 1017

Eighteen cases of tuberculous cervicitis are reported. In one the cervix was the sole tuberculous focus of infection in the genital tract, and the only active one in the patient. Tuberculous cervicitis is chiefly of interest because it clinically resembles cervical carcinoma and announces the presence of genital tuberculosis. The cervix is involved in from 5 to 8 per cent of the cases of tuberculosis of the genital tract, and thus appears to have a relative immunity to this infection. About 90 per cent of the cases of cervical tuberculosis are secondary to upper genital-tract infection. A true primary cervical tuberculosis is extremely rare.

The two chief symptoms are a persistent offensive watery leucorrhea, and bleeding following coitus or douching. Physically the cervix shows symmetrical hypertrophy and superficial friability and the portio may show abnormalities ranging from erosion and eversion to ulceration and papillary granulations.

The treatment should be surgical when possible, and as radical as necessary and as the condition of the patient will allow. The microscopic pathology is described in detail. Large tubercles are found, lying snugly up against lymphatic channels deep in the body of the cervix and Langhans' giant cells and tubercles are found scattered through hyperplastic canal mucosa. The term "primary tuberculous cervicitis" demands that the cervicitis be the only tuberculous lesion in the patient.

EDWARD L CORNELL, M D

Ducuing, J Clinical Exploration of Pelvic Adenopathies in Cancer of the Cervix Uteri (L'exploration clinique des adenopathies pelviennes dans le cancer du col de l'utérus) *Bull Soc de gynec et d'obst*, 1938, 27 773

Recently Clement Simon in his article, "Satellite Pelvic Adenopathy," made the statement that "venereologists and surgeons rarely explore the lateral walls of the pelvis." The present writer believes that such a misconception may be attributable to the neglect of surgeons to write about a procedure which they take for granted. Clinical exploration may not suffice to demonstrate involvement of the pelvic glands and a surgical exploration

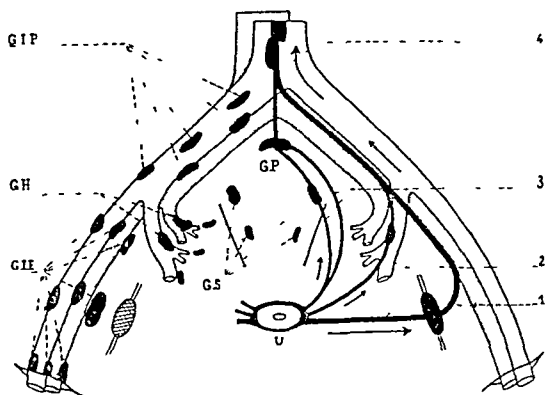


Fig 1 The glands and lymphatics of the uterine cervix (very schematic presentation)

G I E, External iliac glands, G H, hypogastric glands, G I P primitive iliac glands. These glands constitute three chains very clearly demonstrable at the level of the external iliac vessels: the internal chain or subvenous chain, the mesial or venous chain, and the external or extravascular chain. Below the subvenous external iliac chain is depicted the principal gland of Leveuf (crossed lines) and the obturator nerve upon which it lies. G P, gland of the promontory, G S sacral gland. The three lymphatic paths: 1, the principal path ending in the principal gland (Leveuf); 2, the accessory hypogastric path; 3, the accessory path of the promontory and sacral depots; and 4, the collective trunk of the lymphatic vessels and glands confronting the large prevertebral vessels.

may be required, but in response to the above implication, Ducuing undertakes to describe the procedure employed.

After an introductory anatomical orientation with a schematic graphic illustration of the pelvic glands and lymphatics and the topography of the glands in relation to the pelvis, there follows a discussion of the principal types of pelvic adenopathy and their course, including the anterolateral, posterolateral, and posterior, or sacral adenopathies. The course of the adenopathies associated with cancer of the cervix has no special character. The phase of adenitis corresponds to glandular invasion which has not passed beyond the capsule of the gland, during all this stage the adenopathy is movable and the mucosa of the vagina and rectum is immobilized over it. The phase of infection supervenes during varying periods of evolution of the cancer and of glandular involvement. The adenopathy becomes mixed, the glands, up to this point not very large and hard, increase rapidly in size and become painful and soft. Phlegmons incised posterior to or in the vagina of women treated for cancer of the cervix by radium may probably have been adenophlegmons comparable to those of the broad ligament in non-cancerous women.

An exploration of the pelvic glands is most frequently undertaken to determine the stage of the cancer process. According to the Geneva classifica-

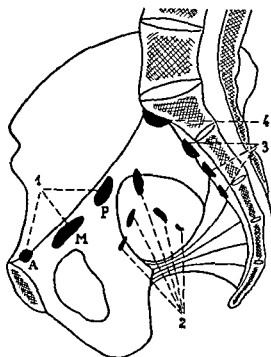


Fig. 2 Location of the pelvic glands in relation to the pelvis (semi schematic) 1 External iliac gland (subvenous chain) A anterior subvenous gland M mesial subvenous gland (principal gland of Leveuf) P posterior subvenous gland 2 hypogastric glands 3 latero sacral gland 4 gland of the promontory

tion cancers of the cervix with adenopathies belong to the third stage. The present writer urged that this be revised to the effect that cancer of the cervix with adenopathy be classified as belonging to Stage IV whatever the condition of the cervical lesions. Exploration of the pelvic glands is undertaken also to detect recurrence of cancer and finally to determine the cause of pain in this region. The sympathetic paths of sensibility are affected principally by infiltrations of the parametrium but some para-cervical hypogastric adenopathies and more frequently adenopathies of the promontory or presacral adenopathies may cause involvement at the level of the hypogastric or presacral nerves. The cerebro-spinal paths of sensibility are more frequently compressed than the sympathetic. This compression may be manifest either at the level of the obturator nerve by principal adenopathies or at the level of the sciatic plexus by hypogastric or sacral adenopathies. In advanced cases invasion of the parametrium and adenopathy become indistinguishable.

The technique of exploration is described in detail including preparation of the patient by evacuation of the intestine and bladder and placing her in

the gynecological position. The different parts of the pelvis must be known as well to the surgeon as they are to the obstetrician and the position of the glands as well as they are to anatomists. Both rectal and vaginal routes of exploration should be used. The exploration is made in several consecutive stages alternately with the right and left hand special procedures being detailed for examination of the anterolateral zone of the pelvis the sciatic region and the sacral promontory.

Difficulties in exploration of the glands are frequently encountered and errors in interpretation are often made in cases of constricted vagina. It is of importance to determine the presence of one or more glands and the nature of the adenopathies whether neoplastic inflammatory or mixed. The usual features of cancerous adenopathy such as hardness absence of pain and adhesion occur in the pelvic glands as elsewhere. Pain is of importance in establishing the inflammatory nature of an adenopathy but there are cases of mixed adenopathy which may likewise be painful. Hot water will cause a regression of inflammatory symptoms and if after regression of a glandular mass a hard nodule still remains cancer should be suspected.

EDITH SCHAEFER MOORE

Martius H. Intravaginal Roentgen Irradiation in Carcinoma of the Cervix (Ueber die intravaginale Roentgenbestrahlung beim Gebärmutterhalscarcinom) *Deutsche med. Wochenschr.* 1938 2 953

This article deals with the advantages of intravaginal roentgen irradiation as compared with the same irradiation method with radium inlays for combating parametrial foci of carcinoma or so-called recurrences in the pelvic wall. The article is illustrated with a number of schematic drawings. An advantage of intravaginal roentgen irradiation is the possibility of easier screening of the screening of radium the gamma rays of which have a half value layer of from 9 to 10 mm. of lead is in practice a very difficult matter even when large quantities of lead are used. It is emphasized that with the first method neither the bladder nor the intestine is exposed and the primary tumor of the cervix can be included in the irradiation and made to disappear. For this reason Schaefer in Kiel has abandoned irradiation of cervical carcinoma with radium and replaced it entirely with roentgen irradiation. The author does not agree with Schaefer on this point in the usual case of carcinoma of the portio or cervix he places the radium within the cervix or crater only and no longer in the vagina.

For the irradiation of carcinomatous gland and metastases both halves of the pelvis are irradiated in addition with moderately high fractionated doses. The superiority of fractionated doses as compared with the single total dose consists in the fact that the fractionating and protracting of the dose allows one to take into separate account the radio-sensitivity of the different kind of tissue and thereby heightens selectivity in respect to carcinoma tis-

sue In the experience of the author, the fractionating of the dose and the considerable increase in the total dose which this makes possible have very quickly improved the therapeutic results in recurrences in the pelvic wall Nevertheless, the supplementary intravaginal roentgen irradiation of Schaefer and Witte presents a new method of attack for carcinoma of the parametrium, in which most of the failures of irradiation treatment must have been observed

Carcinoma of the body of the uterus also is treated by intravaginal roentgen irradiation as supplementary therapy to intra-uterine radium irradiation As demonstration of the superiority of intravaginal roentgen irradiation in the treatment of parametrial infiltration foci in comparison with previous methods of irradiation, the case of a forty-nine-year-old woman in whom a carcinoma of the cervix of second grade was irradiated from August to September, 1931, is cited In December, 1931, carcinoma could no longer be demonstrated, in April, 1932, there was a recurrence in the right parametrium which was treated by protracted percutaneous irradiation, in December, 1932, there was a recurrence, increasing in size, in the right parametrium, which was treated with intravaginal roentgen irradiation with 1,000 roentgens on the right pelvic wall In April, 1934, the recurrence had disappeared, and upon examination in December, 1937, the patient was free of recurrence

The author's statistics brought up to December, 1937, show 81 cases of carcinoma of the uterine cervix treated from one and one-half to five and one-half years previously by this method Twenty-five of the patients are living and free from symptoms, a percentage of healing of 33.5 per cent On the other hand, the percentage of healing of similar cases treated without the supplementary intravaginal irradiation, and observed over a somewhat shorter time, from one and one-half to four years, was 11.6 per cent The material contains 37 cases with an observation time of more than three years, and in one-third of these the patients are free from symptoms

The author feels justified in recommending the further use of intravaginal supplementary irradiation in carcinoma of the cervix

(F SIEGERT) FLORENCE A CARPENTER

Downes, H E A Statistical Tabulation of the Results of Treatment of Carcinoma of the Uterus *Med J Australia*, 1938, 2 1030

The author presents a statistical study of 1,861 cancers of the uterus which were treated prior to June 30, 1934 in the capital cities of Australia, Newcastle, New South Wales, and Launceston, Tasmania The follow-up system in the 13 hospitals of which the records were used permitted a recording of the end-results in 81.6 per cent of the patients

There were 7 chorion carcinomas, 221 cancers of the uterine body, and 1,633 cancers of the cervix Twenty-six per cent of the cancers of the uterine

body and 48 per cent of the cancers of the cervix occurred in women under fifty years of age The percentages of childless patients with carcinoma of the uterine body and with cancer of the cervix were 27 and 10.6 per cent, respectively

Cancers of the body of the uterus are subdivided into 2 stages e.g., growths apparently confined to the uterine body were considered to be in the first stage, and growths which had spread beyond the uterus to neighboring organs or to the peritoneal cavity were considered to be in the second stage The records show that 32.1 per cent of the patients with the less extensive condition, and 8.3 per cent with the more extensive condition, who were treated five or more years ago, were living and free from recurrences A combination of radiological and surgical treatment proved most efficacious

The international definition of the 4 stages of cancer of the cervix uteri, as recommended by the Cancer Commission of the Health Committee of the League of Nations, was used in classifying the 1,633 cancers of the cervix in this series In Stage I, 37.9 per cent, in Stage II, 23.1 per cent, in Stage III, 13 per cent, and in Stage IV, 15 per cent of patients who were treated five or more years ago are living without recurrence Combined radiological and surgical treatment again proved most efficacious

GEORGE H GARDNER, M D

ADNEXAL AND PERIUTERINE CONDITIONS

Lenczowski, J Primary Carcinoma of the Fallopian Tube (Primaerer Eileiterkrebs) *Ginek polska*, 1938, 17 517

The author describes in detail 3 rare cases of primary cancer of the fallopian tube which were very similar with regard to their clinical course as well as to the anatomical structure of the neoplasm The patients were forty-nine, forty, and fifty-one years old Two of them suffered from acute adnexal disease shortly after marriage and remained sterile The third had 2 premature labors, and both pregnancies were complicated by infection of the urinary tract After that she did not become pregnant again It cannot be said with certainty that this last patient did not suffer from early adnexal disease The leucorrheal discharge in all 3 was not clean, at times it was watery, and in 2 cases bloody secretion occurred between the menstrual periods

All 3 patients complained of variable pains in the lower abdomen In 2 cases the pains were of a spastic nature with irritation of the peritoneum and elevation of the temperature This peritoneal irritation recurred in spite of treatment and, according to the author, is an important symptom in carcinoma of the tube In 2 cases which were operated upon the disease was bilateral In 1 of these cases carcinomatous hyperplasia with cystic degeneration was diagnosed in both tubes A metastatic focus was found in the mucosa of the cavity of the uterus in 1 case, and in the cervix in another In the third case carcinoma was demonstrated only in the left

tube which was adherent to the posterior cervical surface. The cancer penetrated deeply into the musculature of the uterus. In all 3 cases the tubes were thickened and spindle shaped and cancerous masses were found in the ampulla and in the isthmus. The histological diagnosis was that of a malignant papilloma. In some areas there were islands of gland like structure as well as solid masses. In 2 cases adeno myosis of the uterine cornu was demonstrated. The author believes that the cause of cancer of the tubes is inflammation. Two patients died within two years in spite of radical operation and later x ray treatment. The third patient who was operated upon lately is still well.

The author calls special attention to the peritoneal reaction which occurred but which is seldom observed and considers it a characteristic symptom of tubal cancer. (B. KOWALSKI) LEO A. JUINKE M.D.

Diaz Colodrero A. A. Functioning Tumors of the Ovary (Tumores funcionantes del ovario) *Rev méd-quirurg de patol femenina* 1938 7 662

According to Ahumada ovarian tumors may be subdivided as follows (1) epithelial tumors (2) fibrous tumors and (3) teratomas. Epithelial tumors may be benign or malignant and the latter may be subdivided into primary metastatic and cystic carcinomas. Some of the primary carcinomas may have a hormonal effect on the genital tract or the secondary sexual characteristics.

Robert Meyer distinguishes the following functioning ovarian tumors: arrhenoblastomas with a masculinizing effect, granulosa cell tumors with a feminizing effect and dysgerminomas without an appreciable hormonal function.

The author furnishes detailed histories of 9 cases of dysgerminoma, 10 cases of granulosa cell tumor and 1 case of arrhenoblastoma and discusses the pathogenesis, symptomatology, differential diagnosis, evolution, prognosis and treatment of the functioning tumors of the ovaries.

JOSEPH K. NARAT M.D.

MISCELLANEOUS

Hall F. C. Menopausal Arthralgia. A Study of 71 Women at Artificial Menopause. *New England J. Med.* 1938 219 1015

Many observers have noted the great frequency with which women at the menopause suffer from arthritis or from vague joint disturbances.

This report includes the study of 71 women whose arthritis occurred following castration. Most of them were treated with large doses of estrogenic material over a period of many weeks—some for months and years.

Fifty three patients suffered from arthralgia rather than true arthritis. Of 40 patients who were adequately treated 80 per cent were materially (from 50 to 100 per cent) relieved while 70 per cent responded to the extent of almost complete relief of menopausal and arthralgic symptoms.

There were 18 patients with true arthritis (atrophic hypertrophic or mixed). Fifty per cent of those with menopausal symptoms and arthralgia were relieved of these symptoms and in some cases the arthritis was improved by estrogenic therapy.

There is evidence that the removal of ovarian hormones may cause various joint disturbances, some mild and self limited and others severe disabling and even crippling and that estrogenic therapy will prevent or control these disturbances together with the usual menopausal symptoms in a high percentage of cases. These arthralgias therefore appear to represent one of the symptoms of the menopause.

Evidence has been offered for the existence of a menopausal arthritis better called menopause arthralgia. It seems proper to reserve this term for conditions associated with deficiency of the ovary and menopausal symptoms. The existence of true menopausal arthritis still remains unproved but the question merits further study.

CHARLES BARON M.D.

Geist S. H., Salmon U. J. and Gaines J. A. The Use of Testosterone Propionate in Functional Bleeding. *Endocrinol.* 31 1938 23 784

The effect of testosterone propionate was studied in 25 cases of abnormal uterine bleeding. In 21 of these there was no palpable evidence of organic disease. In 4 examination revealed small intramural myomas. Suction curettages were performed before treatment and in 18 cases revealed a secretory phase premenstrually in 2 hyperplasia of the endometrium and in 3 others a proliferative phase during the seventh, sixteenth and twenty first day of the cycle respectively. With doses varying from 300 to 1000 mgm. per month the excessive bleeding was controlled in all but 2 cases. In 18 cases normal menses were established in 5 there has been amenorrhea of from one to five months duration up to the present time. In 2 cases the amount of bleeding was not affected. Endometrial biopsies performed during and after the period in which testosterone propionate was administered revealed the following morphological changes: (a) disappearance of the secretory phase (85 per cent) and (b) inhibition of the proliferative phase often with regression to the hypoplastic or atrophic state. Within a month following the cessation of treatment the endometrial biopsies revealed evidence indicating a beginning regeneration during the period of amenorrhea. A sufficient number of cases have not yet been followed up for a long enough period after treatment to determine the duration of the therapeutic effect.

Testosterone propionate (in doses of from 300 to 1000 mgm. per month) inhibits menstruation and arrests the endometrium at the early proliferative phase which prevents the development of progestational changes. Larger doses cause varying degrees of regression of the endometrium to the state of hypoplasia or atrophy. Following the discontinu-

ance of therapy, the inhibitory effects on the endometrium gradually disappear and normal estrogen and progesterone effects reappear. It is suggested that the regressive changes noted in the endometrium after the administration of testosterone propionate are the end-results of a primary inhibition of the gonadotropic factors of the hypophysis, which causes suppression of the ovarian cycle and consequent cessation of the production of estrogen and progesterone.

GEORGE H. GARDNER, M.D.

Figarella, J., and Jean, A. Primary Evisceration Following Hysterectomy, Clinical, Etiological, and Therapeutic Considerations (*L'éviscération primitive après hysterectomie. Considérations cliniques, étiologiques et thérapeutiques*). *Gynec et obst.*, 1938, 38: 409.

Figarella and Jean report 3 cases of early primary evisceration following hysterectomy, observed in one year, which presented such etiological, clinical, and therapeutic similarities as to allow them to be grouped together.

Postoperative eviscerations are rare and are divided into immediate, early, and late eviscerations, the early ones are the most frequent (80 per cent) and occur about the eighth day after the intervention. Functional and general symptoms are usually discreet and it is only later, when the evisceration has not been recognized or when attempts at reduction by inadequate means have been tried, that the general condition of the patient becomes gradually aggravated. The evisceration is nearly always discovered at the time the last sutures are removed, or even several days later, and its evolution is progressive, the parietal line of suture opening from outside inward until an intestinal loop is exposed. Generally, the aspect of the wound is atonic, no hematoma and no local suppuration are ever observed. The eviscerated organ, which is usually a loop of the small intestine, presents numerous adhesions to the parietal peritoneum.

Etiologically, it is evident that there is a disturbance in the cicatrization of the wound, because of defective functioning of the vascular system at this point. The interfering factors are numerous. Among the pre-operative factors are the general diseases, syphilis being the principal cause of the disturbance in the authors' cases. This was demonstrated by the histories of the patients and the favorable results obtained by specific treatment. The operative factors act only as predisposing causes, while the post-operative factors act partly as predisposing and partly as effective causes, cough, vomiting efforts, early rising, and abdominal distention are found in most histories, but their role is purely mechanical. Small parietal suppurations, localized hematomas, and phlebitis of the parietal veins should be more important causes. However, they have not been discovered in the present cases. This leaves only syphilis as the most important factor.

Preventive treatment of evisceration consists of banal precautions: a careful selection of patients

should be made, as operation is contra-indicated in obese, aged, and diseased individuals, the Wassermann test is indispensable and, if it is positive, immediate specific treatment must be instituted, strict asepsis during operation, careful suture of the abdominal wall, late removal of the sutures, late rising, and attention to cough, vomiting, and defecation are indicated. When evisceration occurs, medical treatment suffices during the first stage of superficial dehiscence, neoarsphenamine being the most active substance among all the specific drugs. During the second stage, when the intestine is found in the wound, immediate surgical treatment is nearly always necessary, after the liberation of adhesions, the cleansing of the intestinal loops with warm physiological saline solution, and, if necessary, the resection of the margins of the wound, the treatment of choice is closure of the wound in one plane with metallic sutures. Drainage is not indicated except in cases in which the wound is infected or there is a peritoneal reaction.

RICHARD KEMEL, M.D.

Loeser, De Larnage, Sabatier, Barbellion, and Others. A Discussion on the Treatment of Genital Gonorrhea in Women (*Les traitements de la blennorrhagie génitale de la femme*). *Rev. franç. de gynec. et d'obst.*, 1938, 33: 687.

In the opening contribution to this discussion, Loeser, of London, describes the treatment of gonorrhea by means of intradermal injections of live cultures of the gonococcus. For the preparation of these cultures a strain, or preferably several strains, of gonococcus from a recent case of gonorrhea is cultured for forty-eight hours on ascitic gelose or ascitic fluid bouillon. If the former medium is used it is diluted with physiological saline for injection, if the latter, dilution is not necessary, 1.5 c. cm. of the fluid is used for injection, a dosage of from 4 to 5 billion organisms. The injection is made into the derma, usually in the forearm. This form of treatment is indicated in acute and chronic gonorrheal arthritis, for women with chronic, resistant gonorrheal infection of the cervix and adnexa, and in more acute cervical infections showing a tendency to extension. The author recommends this treatment also in cases of cervical infection in pregnancy. The injections cause no severe reactions. Among more than 10,000 injections given, of which the author has collected records from his own and other clinics, only 0.06 per cent showed a complication attributable to the treatment, while from 80 to 85 per cent of the cases treated were cured.

De Larnage, of Paris, reports the use of gonococcus vaccine by local application to the cervix, combined with intramuscular injection. The vaccine employed is a filtrate of a pure gonococcus culture or of a polyvalent culture containing other organisms. Cervical tampons soaked with the vaccine are left in place forty-eight hours, tampons should be placed also in the cul-de-sac, if necessary, intracervical instillations are given, beginning with a small dosage, from 1 to 2 c. cm., and increasing grad-

ually This method of treatment may be combined with diathermy to relieve pain and if the cervix is ulcerated with cauterization of the cervix at the end of the vaccine treatment The author has obtained good results with this method in most cases

Sabatier of Montpellier reports the treatment of gonorrhea in a castrated woman by injections of the follicular hormone benzoate of dehydrofolliculin Three injections of 1 mgrm each were given at the beginning of treatment and after an interval of more than a month the series was repeated Not only were the menopausal symptoms relieved but the gonorrheal lesions (vulvovaginitis) healed promptly with very little local treatment The author suggests that folliculin is of value not only in gonorrheal vulvovaginitis in children but also in such lesions in women in the menopause either physiological or artificial

Barbellon of Paris reports the use of various sulfanilamide compounds in gonorrhea in women especially 1162 F He has found this treatment more successful in subacute or chronic cases than in acute cases In the latter larger doses are required and toxic reactions are more likely to occur In the subacute or chronic cases a dosage of 2 gm daily for from eight to ten days usually gives good results if combined with local treatment The dosage should not exceed 3 gm daily and this dosage should not be used for more than five days

Dal ace and Danziger report the use of the sulfanilamide compound 1399 F in 30 cases of genito urinary gonorrhea in women The dosage employed varied from 1.5 to 3 gm daily for from three to ten days In 18 cases a cure was obtained which was confirmed by repeated bacteriological examinations In 12 cases the patients were not cured 1 recurrence in two months being included in this group Twelve of the patients showed slight toxic symptoms such as cyanosis headache vertigo and insomnia In 3 cases the treatment did not prevent the development of local or arthritic complications but in 1 case synovitis of the foot was relieved at the same time that the gonorrhea of the genito urinary tract was cured

Durel of Paris has found that the chief indications for sulfanilamide treatment in gonorrhea in women are purulent endocervicitis and urethritis In cases in which there is involvement of Skene's Bartholin's or Naboth's glands supplementary local treatment is necessary to clear up these foci The two compounds most frequently used are 1162 F and 1399 F the dosage is the same for both For most cases the daily dose is 3 gm for the first seven days and 2 gm for the next seven days In acute cases and cases complicated by involvement of the adnexa a heavier dosage is employed beginning with 4 gm for the first five to seven days With this larger dosage patients should be kept in bed and under constant medical supervision With the usual dosage a second course of treatment may be given after an interval of at least five days with doses of from 1.5 to 2 gm daily for from seven to ten days

With 1162 F headache and vertigo are the most frequent toxic symptoms with 1399 F cyanosis is more frequent With the dosage employed, these symptoms are usually of mild degree Iron and alkalis (sodium bicarbonate) may be combined with the sulfanilamide to advantage The author is convinced that 60 per cent of women with gonorrhea will be definitely benefited by the use of sulfanilamide therapy

Beclere of Paris states that he has used sulfanilamide in the treatment of only 15 cases of gonorrhea in women 10 of these were completely followed up Only 1 patient showed definite cyanosis and 1 developed gingivitis during treatment when the treatment was discontinued these symptoms subsided Several patients complained of a feeling of fatigue during treatment The maximum dosage was 6 tablets a day (3 gm 1162 F) in several cases the daily dosage did not exceed 2 gm During the treatment patients were kept on a strictly lactovegetarian diet The most marked effect of the treatment was the prompt diminution and in some cases cessation of cervical discharge For permanent results treatment should be continued for a month In cases with involvement of the adnexa diathermy can be combined to good advantage with sulfanilamide treatment in some cases electrocoagulation of the cervix also is indicated

Boursat of Paris reports the use of sulfanilamide (1162 F) in 50 women (prostitutes) with gonococcus infection The usual dosage employed was 4 gm daily for eight days then 3 gm for another week The best results were obtained in endocervicitis the discharge became clear and was negative for gonococcus in about two weeks in 15 cases of this type The results were less satisfactory in exocervicitis and in cases with involvement of Bartholin's glands In cases with involvement of the adnexa some of which had been treated by other methods without relief pain was relieved by the sulfanilamide treatment and this was often accompanied by a diminution in the adnexal mass in 3 cases this mass entirely disappeared No serious toxic reactions were observed with the dosage employed minor symptoms subsided when the medication was discontinued

Gate and Cuilleret of Lyons have treated 47 cases of gonorrheal urethritis and cervicitis with sulfanilamide (1162 F) At first a dosage of from 3 to 4 gm daily was given but more recently the authors have employed an initial dose of 2.50 gm for five days followed by from 1.50 to 2 gm daily for from another thirteen to fifteen days No other treatment was employed but in cases in which Skene's or Bartholin's glands are involved local treatment may be necessary The authors report a cure bacteriologically controlled in all their cases The treatment was well tolerated some patients complained of headache or a transient feeling of weakness only 1 patient had a skin eruption with fever and this subsided in three days Blood counts

showed a slight diminution of both the red and white cells, the cell count returned to normal promptly when treatment was discontinued

Sosnowska, of Paris, notes that her method of gynecological massage has proved very useful in the treatment of chronic gonorrhea in women, including involvement of the adnexa

Béclère, of Paris, notes that the involvement of the fallopian tubes in gonorrheal infection in women is often latent, and symptoms may develop only after treatment of the cervical infection has been instituted. In chronic cases in which such involvement of the adnexa is probable, the author advocates diathermy treatment of the adnexa as the first stage in the treatment. The treatments are begun immediately at the close of one menstrual period and continued until the menstruation occurs again. Unless there is a latent hydrosalpinx, this treatment results in relief of pain, diminution of the discharge, and improvement in the patient's general condition. If this is the case the second stage in treatment is electrocoagulation of the cervix. If a hydrosalpinx is present, however, active treatment of the cervix is contraindicated. After electrocoagulation of the cervix, a second series of diathermy treatments is given. The author has used this method for four years with good results.

Halphen, Auclair, and Dreyfus, of Paris, have employed shortwave diathermy in the treatment of gonorrheal infection of the adnexa. Treatment is carried out intensively from the first. Of 200 women treated by this method, 97 per cent were cured within a month and 84 per cent within ten days.

Netter of Paris, in discussing the various methods of treatment proposed for gonorrheal infection in women, notes that the fact that so many different methods have been advocated is an indication that no one method is entirely satisfactory in all cases. Local treatment with antiseptics and tampons is effective only when the infection has not reached the cervix. Vaccine therapy with a specific vaccine is often of value. The new sulfanilamide compounds are undoubtedly effective in many cases of gonorrhea in women. Diathermy, he believes, should be reserved for the more chronic forms of gonorrheal disease of the adnexa. In the treatment of cervical lesions, electrocoagulation of the cervix has very generally replaced cauterization among French gynecologists. Gynecological massage has given good results in cases of chronic gonorrheal salpingitis and cellulitis, it should be employed only when the first treatment causes no reaction within three days.

Chalier, of Lyons, states that he has treated gonorrheal salpingitis as well as other forms of chronic salpingitis by total linear salpingotomy. In this operation, which is not used in cases in which there is pyosalpinx, the tube is liberated from all adhesions, and is then opened up along its entire length, all pathological secretions and inflammatory tissue are removed, any strictures are sectioned. This may be done to best advantage with the electric cutting current. The author has had good results with this operation, and the tubes appear to regain their normal permeability and function. He reports 1 case in which normal pregnancy occurred after this operation.

ALICE M. MEYERS

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Concetti F. A Contribution to the Histopathological Study of Diverticular Tubal Pregnancy (Contributo allo studio isto patologico della gravi danza tubarica diverticolare) *Riv ital d g nec* 1938 21 499

Tubal diverticula may be divided into 2 classes according to their genesis (1) total or partial double formations due to congenital malformation (2) canals issuing from the tube having a proper tunic varying in length and ending in a blind sac probably also due to malformation (the abnormal development of Mueller's canal) and (3) real diverticula of varying length generally running in the thickness of the tubal wall. The origin of the last is not well known in this group may be included the paratubal diverticula often found in nodular isthmus salpingitis.

Concetti describes a case of interstitial pregnancy with a prevalently intramural location in which the insertion of the ovum had occurred in a tubal diverticulum. This diverticulum ended in a cul de sac in the peripheral part of the external circular layer of the tube itself and about half way down its course opened into the cavity containing the ovum. The patient was a woman aged twenty nine years who died on the day following the intervention for rupture of the ectopic pregnancy. The ovum was found to be in good condition its histological aspect suggesting that it was still living at the time of operation. The histological examination left no doubt that this was a real diverticulum its structure which consisted of cubic epithelium without a proper tunic and caused the epithelium to adhere directly to the muscular tissue made it appear to be of inflammatory nature this supposition was supported by the anamnesis. That the ovum had not developed in the tube but in the diverticulum was proved by the fact that the tube was not enlarged that its lumen at the point of interruption was of the same size as in other parts and that the tubal wall appeared to have been worn away from the outside. The external diameter of the ovum with the villi (11.5 mm) and the approximate diameter of the chorion cavity (8 mm) the finding of beginning traces of blood vessels without blood in the villi the size and morphology of the embryonic formations and the absence of blood spaces in contact with the trophoblast fixed the age of the ovum at about twenty days. The trophoblastic theca which at some points could be differentiated from the maternal tissue only with difficulty and contained no syncytiotrophoblastic cells was least developed on the inside of the most reduced wall and the decidual reaction was completely absent at this point although it was present everywhere else in contact with the villi.

The rupture of the ovum cannot be attributed solely to the destructive action of the villi on the

wall of the diverticulum distention due to the expansive power of the ovum must also be taken into consideration. In the present case the ovum located in a diverticulum exerted a homogeneous concentric compression early. Under the circumstances the parts of the wall which had good resistance were those that faced the uterus because they were protected by its backing of muscular tissue and that directly opposing it while all the remaining parts were reduced in thickness and more liable to early rupture. This shows that diverticular development of the ovum not only is an important causative factor but it also aggravates the already serious prognosis of extra uterine pregnancy. A noteworthy observation was that the decidual reaction was found strictly limited to the pregnant territory. This finding seems to indicate that the first determining stimuli reach the tissues directly from the villi; without the intervention of other glands however it does not exclude the correlation of a pre existing gravidic endocrine substrate favoring the decidual reaction.

RICHARD KEMEL M.D.

Ostling K. Aneurysms of the Renal Splenic and Hepatic Arteries (Ueber Aneurysmen in der A. renalis lienalis und hepatica) *Acta obst et gynec Scand* 1938 18 444

Aneurysm of the renal splenic and hepatic arteries are exceedingly rare. In a series of over 1000 autopsies 3 aneurysms of the renal and hepatic arteries were found and 9 of the splenic artery. An account of 3 cases of rupture of such aneurysms in association with pregnancy is given. The rupture of the renal aneurysm occurred shortly before full term rupture of the splenic aneurysm occurred nine days following delivery and rupture of the hepatic aneurysm occurred during the eighth month of pregnancy. In all of the cases the symptoms were violent and the patients died within twenty four hours. The patient with the hepatic artery aneurysm had a definite hypertension on 245/155. None of the cases were diagnosed clinically.

The author's own cases as well as cases published earlier in the literature show that acute cases of ruptured renal aneurysm give symptoms which make a probable diagnosis possible. The patients experience sudden violent pain followed by tenderness and muscular resistance in either renal region. In regard to the other two forms of ruptured aneurysm it is generally impossible to reach a more definite diagnosis than that of internal hemorrhage. In none of the cases reported by the author was operation carried out. The author believes that operation would prove of no avail in these acute cases. Microscopic study showed all of the patients to have defects of the external elastic lamella but the genesis of the defects is not elucidated.

ALGER F. JONES JR. M.D.

Valle, G The Action of Some Diets on Nephropathies of Pregnancy Clinical and Experimental Studies (Azione di alcune diete sulle nefropatie gravidiche Ricerche cliniche e sperimentali) *Ginecologia*, Torino, 1938, 4 737

The literature shows that the problem of the participation of diet in the origination and course of renal disturbances during pregnancy is still unsolved. A questionnaire sent to the various obstetrical institutes of Italy to determine the details and results of the dietetic and medicinal treatment in cases of renal insufficiency during pregnancy reveals that dietetic treatment is used in 98 per cent of the cases. Three diets are prescribed: aqueous, lacteal, and lacto-vegetarian, according to the gravity of the cases. It appears that these diets are capable of completely curing about one-third of the cases and of allowing pregnancy to proceed to term in another fifth of the cases, although signs of renal disease persist. Intra-uterine death of the fetus occurs in 7 per cent of the nephropathies, and spontaneous premature labor in more than 26 per cent. Forty-five cases of eclampsia, appearing after at least three days following admission, are reported. In cases of hypertension due to renal insufficiency of pregnancy, rest, diet, and purging return the arterial pressure to normal in 80 per cent and reduce it markedly in 15 per cent. The results of medicinal treatment seem to be less uniform.

Valle made a study of a considerable number of healthy and nephropathic pregnant women receiving various special diets, and found that the daily administration of proteins and fats, even in large quantities, did not increase the frequency of clinically demonstrable renal insufficiency in the healthy women, and that generous quantities of proteins, fats, and salt did not cause the appearance of toxic symptoms, however, in some cases the arterial pressure was increased after the ingestion of large amounts of salt. In the cases of renal insufficiency, the saltless meat diet resulted in complete disappearance of the symptoms in slight cases and did not change the albumen rate in the urine in grave cases, but the addition of salt to the diet intensified the symptoms and made them reappear after they had disappeared under the ordinary dietetic treatment, during the puerperium the salt-tolerance test was negative even in cases of grave renal insufficiency. Consequently, an alimentary pathogenesis of the gestoses was excluded, the maternal organism became ill only when the products of the ovum entered the circulation, and salt exerted a toxic action only when the ovular toxins had already caused anatomical and functional changes in the organism. Therefore, it seems dangerous to undernourish the nephropathic pregnant woman, and the following diet is advisable according to the type of cases:

1 In forms of acute renal insufficiency, the diet should correspond to about the standard diet of Karel (from 800 to 1,000 c cm of milk taken in 5 fractional doses), which is preferable to the absolute aqueous diet.

2 If the treatment is not immediately obstetrical, in forms with primary inflammatory character or those aggravated by pregnancy, the diet must cover the basic requirements and be poor in fluids, salt, and proteins.

3 In forms with degenerative character or pregnancy nephroses, which are the most frequent, the diet must provide 2 gm of protein per kgm of body weight, from 20 to 40 gm of fats, and about 300 gm of carbohydrates per day, a limited amount of fluids, and practically no salt. RICHARD KEMEL, M D

LABOR AND ITS COMPLICATIONS

Caldwell, W E, Moloy, H C, and D'Esopo, D A
Studies on Pelvic Arrests *Am J Obst & Gynec*, 1938, 36 928

For the purpose of this report, 500 cases have been chosen from selected material and divided into five groups according to the method employed for delivery.

TABLE I—DISTRIBUTION OF PELVIC TYPES ACCORDING TO THE METHOD OF DELIVERY

| | Anthropoid | Anthropoid gynecoid | Android anthropoid | Gynecoid | Android | Android gynecoid | Gynecoid flat | Android flat | True flat | Rachitic flat | Number of cases |
|------------------|------------|---------------------|--------------------|----------|---------|------------------|---------------|--------------|-----------|---------------|-----------------|
| Spontaneous | 10 | 15 | 9 | 37 | 10 | 8 | 5 | 4 | 2 | 0 | 100 |
| Low forceps | 16 | 15 | 10 | 32 | 16 | 5 | 3 | 2 | 1 | 0 | 100 |
| Low midforceps | 13 | 10 | 12 | 12 | 21 | 14 | 5 | 0 | 4 | 0 | 100 |
| Midforceps | 12 | 2 | 12 | 35 | 35 | 9 | 6 | 8 | 1 | 0 | 100 |
| Cesarean section | 11 | 5 | 9 | 12 | 41 | 7 | 3 | 6 | 2 | 4 | 100 |
| Total | | | | | | | | | | | 500 |

There is an increased frequency of small diameter of the pelvis from the group of cases with spontaneous delivery to the group requiring cesarean section. However, this high frequency of small diameters in low-medium and medium forceps cases shows that small diameters do not preclude the possibility of safe delivery through the natural passages. Safe delivery, under such circumstances, may depend upon the efficiency of the forces of labor or the use of mechanical skill in operative deliveries when the pelvis is abnormal (See Fig 2, *Internat Abst Surg*, 1939, 68 501).

Transverse arrest of the head is characteristically associated with either a flat or an android type of pelvis. In delivery, this fact must be appreciated and the transverse position maintained to a low level. If convergence of the side walls exists, then anterior spiral rotation is advisable in android types. Success in manual or forceps rotation at the level of arrest usually implies that an ample anteroposterior diameter is present. In 48 of 100 "medium-forceps" cases, the head was found in the transverse position.

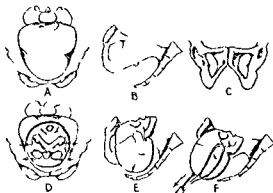


Fig. 1 The mechanism of delivery from arrest in the occipitopositor position to lower levels in the same position 1 And old anthropoid type of pelvis with a long anteroposterior diameter prominent ischial spines and converging side walls 2 Lateral view to show ample posterior pelvic capacity because of an average curvature and inclination to the sacrum 3 Anteroposterior view of the slightly narrowed subpubic arch 4 Arrest in the occipitopositor position lateral view 5 Arrest in the occipitopositor position lateral view 6 A pelvic application of pelvic curved forceps is made and traction exerted downward and forward A low complete rotation may be accomplished with caput in sight

Arrest of the head in midpelvis in the occipitopositor position is most frequently associated with two pelvic types the ample android type with slight convergence and the flat type with a backward sacrum These latter two factors (convergence or backward sacrum) create ample anteroposterior space in the midpelvis to allow the occiput to rotate posteriorly Incomplete flexion and molding of the head favor the maneuver of manual rotation of the head to the transverse position with the application of Barton forceps followed by lateral flexion and descent with low rotation Arrest in more characteristic anthropoid forms has been successfully treated by a pelvic application of forceps to the occipitopositor position with descent to a lower level and rotation with caput in sight A Scanzoni maneuver was rarely used at the level of arrest and was successful only with a small child in an ample anthropoid form In the low medium arrest of the head in the occipitopositor position the number of characteristic anthropoid forms increases Maximum flexion and molding of the head have allowed greater success in complete rotation by manual or instrumental methods than occurred with arrest at a higher level

In a critical review of these cases the authors find that the mechanical procedures employed were open to criticism in at least 10 since the correct methods of obtaining the optimum available space in the pelvis were not used In 4 of the cases the amount of disproportion present at the time of the forceps operation was a definite contraindication to this procedure and either a cesarean section should have

been done earlier in labor or if possible the labor should have been allowed to progress until further molding had occurred

In the discussion MELNADO said he had encountered abnormal pelves in only 20 per cent of 111 midforceps operations while Caldwell showed 60 per cent This situation is highly contradictory There must be some explanation for the wide difference in the two clinics more deeply fundamental than that explainable by methods of classification

EDWARD L CORNELL MD

Trillat P and Magnin P A Statistical and Critical Study of Retroplacental Hemorrhage Observed in 20 000 Deliveries (Étude statistique et critique des hémorragies rétro-placentaires observées sur un ensemble de 20 000 accouchements) Rev franç de gynéc et d obst 1938 33 901

Among 20 000 deliveries at the Maternité Ecole des sages femmes de Lyons there were 66 cases of retroplacental hemorrhage In 14 the placenta was abnormally inserted but the clinical character of the cases was not essentially different from that of the other cases in which the placenta was normally inserted

Three clinical types of retroplacental hemorrhage are distinguished

1 The mild type in which the separation of the placenta is only partial i e involves not more than half the area of the placenta and a living child is delivered There were 20 such cases in the authors series These cases were delivered normally in 11 cases the membranes were ruptured artificially and in 1 case digital dilatation of the cervix was subsequently done in 1 case a digital dilatation after spontaneous rupture of the membranes was performed and in the remaining cases no obstetrical intervention was used In only 1 of the cases was there a post partum hemorrhage of over 1 000 gm

2 A type of moderate severity in which the infant is dead before delivery but the mother's condition is not serious there were 42 cases of this type In none of these cases was operation performed of the obstetrical procedures carried out the most frequent was artificial rupture of the membranes in 3 cases craniotomy was done in 2 cases podalic version in 1 case Braxton Hicks version in 1 dilatation of the cervix in 1 bringing down a foot and in 2 cases forceps were used but after rupture of the membranes

3 The severe type of uteroplacental apoplexy operation was not attempted in any of the 4 cases of this type 1 of these patients died the only one in the series In 2 cases a foot was brought down in the fatal case this procedure was preceded by rupture of the membranes and a digital dilatation In 1 case only cervical dilatation was done and in the fourth case no obstetrical procedure was used

In the moderately severe and very severe types of retroplacental hemorrhage (Types 2 and 3) the death of the fetus results from the nature of the placental lesion and the authors believe that operation is not

any advantage to the mother. In the least severe type the child is delivered spontaneously if the dilatation of the cervix is adequate, if not, delivery may be hastened by various obstetrical procedures.

In 34 of the 66 cases, including cases of all 3 types, there were no symptoms of toxemia, the mother's condition was better in these cases than in those with an associated toxemia. In this series the majority of the patients were multiparas and more than thirty years of age. In the treatment of these cases, in addition to the obstetrical procedures indicated, physiological saline solution, given subcutaneously or occasionally intravenously, and cardiac tonics were employed. In cases with toxemia, chloral was used, and in 1 case morphine gave favorable results. No oxytocic was used.

ALICE M. MEYERS

NEWBORN

Bessau. Contributions to the Physiology of the Newborn (Zur Physiologie des Neugeborenen). *Arch f Gynaek*, 1938, 166: 419, 479.

Bessau emphasizes those facts in the physiology of the newborn which to him seem most important for the management of the raising of children. He applies the name "stable" functions to those which are already present during fetal life, whereas those functions which characterize extra-uterine life, especially respiration and ingestion of nourishment, are classified under the term "labile" functions. In the presence of subdued excitability of the respiratory center (cyanosis of children) lobelin and icoral are recommended, and attention is called to the importance of the application of warmth in thermolabile children. The metabolic processes represent the chief problems of the physiology of the newborn. Attention is also called to the abrupt change in the manner of nourishment in the transition from intra-uterine to extra-uterine life, as well as to the danger of disturbances which may arise from this transition.

In this discussion Bessau differentiates between dystrophy and dysergia. In part, the effects of this condition are represented by the tendency toward infection, diarrhea, and edema, the first he attributes to the scarcity of antibodies, the second, to insufficient function of the intestinal mucosa, and the third to insufficient capillary function. Attention is also called to the importance of breast nursing and especially to the feeding of colostrum. Bessau is cognizant of the statement previously made by Lindig that the colostrum protein bodies pass directly through the gastric and intestinal walls. Colostrum also has a special significance because of its antibodies and vitamin content, in this connection especial attention is directed to the colon antibodies.

Undernutrition is less harmful than other defects in the administration of nourishment. In an emergency water can be added to the feeding. The

mineral content and the vitamin requirements are completely sufficient. In the event that complementary feeding should prove necessary, milk from a wet-nurse is most desirable. However, if this milk is not taken directly from the breast of the wet-nurse it should be carefully protected from colon infection. The sterilized milk of wet-nurses which is obtained at central stations is not equal to the raw wet-nurse milk, but nevertheless it is superior to complementary artificial feedings. According to Bessau, the danger of colon infection stands paramount in every form of complementary feeding. The mortality figure caused by artificial feeding alone, according to Bessau, amounts to 3 per cent.

In concluding, the author calls attention to the technique of weaning by means of which it is possible in institutions to bring about an almost sufficient weaning in 95 per cent of all mothers during the early period of lactation.

(VON JASCHKE) HARRY A. SALZMANN, M.D.

MISCELLANEOUS

Cramer, F. E. K. The Friedman Reaction in Ovarian Grafts Transplanted into the Anterior Eye Chamber of Rabbits (Reacción de Friedman sobre injertos de ovario en la cámara anterior del ojo de la coneja). *Rev med quirurg de patol femenina*, 1938, 7: 501.

Friedman's reaction allows an early diagnosis of pregnancy. The ovarian graft may be used for repeated examinations. In 1 case the graft remained in good condition for three hundred and thirty-seven days. Careful examination of the graft not only after but also before the injection of the urine is indispensable. Among the complications after the transplantation, opacities of the cornea, prolapse of the iris, and panophthalmia must be mentioned. The author injects intravenously 10 c cm of urine the first twenty-four hours and later on 5 c cm each day. In many instances only one injection was used. A specimen of the first urine passed in the morning at the temperature of the room is introduced slowly. While several authors recommend an ether extraction of the urine, the writer of this paper does not consider such preparation necessary.

The following changes in the graft may be observed after the injection of the urine from a pregnant woman: (1) congestion, (2) rapid appearance of follicles, (3) increase in the size of the graft, (4) swelling of the iris in the vicinity of the graft, (5) appearance of hemorrhagic follicles, and (6) hemorrhages in the anterior chamber of the eye. On the basis of the congestion alone one is not justified to consider the reaction as positive. The author concludes from his 56 observations that Friedman's reaction is dependable in the diagnosis of pregnancy.

JOSEPH K. NARAT, M.D.

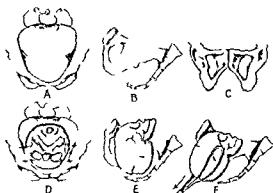


Fig. 1. *T* mechanism for delivery from arrest in the occipitoposterior position to lower level in the same position. *A* Android anthropoid type of pelvis with a long anteroposterior diameter, prominent ischial spines and converging side walls. *B* Lateral view to show ample posterior pelvic capacity because of an average curvature and inclination to the sacrum. *C* Anteroposterior view of the lightly narrowed subpubic arch. *D* Arrest in the occipitoposterior position, inlet view. *E* Arrest in the occipitoposterior position, lateral view. *F* A pelvic application of pelvic curved forceps is made and traction exerted downward and forward. A low complete rotation may be accomplished with caput in sight.

Arrest of the head in midpelvis in the occipitoposterior position is most frequently associated with two pelvic types: the ample android type with slight convergence and the flat type with a backward sacrum. These latter two factors (convergence or backward sacrum) create ample anteroposterior space in the midpelvis to allow the occiput to rotate posteriorly. Incomplete flexion and molding of the head favor the maneuver of manual rotation of the head to the transverse position with the application of Barton forceps, followed by lateral flexion and descent with low rotation. Arrest in more characteristic anthropoid forms has been successfully treated by a pelvic application of forceps to the occipitoposterior position with descent to a lower level and rotation with caput in sight. A Scanzoni maneuver was rarely used at the level of arrest and was successful only with a small child in an ample anthropoid form. In the low medium arrest of the head in the occipitoposterior position the number of characteristic anthropoid forms increases. Maximum flexion and molding of the head have allowed greater success in complete rotation by manual or instrumental methods than occurred with arrest at a higher level.

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EDWARD L. CORNELL, M.D.

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2. A type of moderate severity in which the infant is dead before delivery, but the mother's condition is not serious; there were 42 cases of this type. In none of these cases was operation performed; of the obstetrical procedures carried out the most frequent was artificial rupture of the membranes. In 3 cases craniotomy was done, in 2 cases podalic version, in 1 case Braxton-Hicks version, in 1 case dilatation of the cervix by bringing down a foot, and in 2 cases forceps were used, but after rupture of the membranes.

3. The severe type of uteroplacental apoplexy; operation was not attempted in any of the 4 cases of this type, 1 of these patients died, the only one in the series. In 2 cases a foot was brought down, in the fatal case this procedure was preceded by rupture of the membranes and a digital dilatation. In 1 case only cervical dilatation was done, and in the fourth case no obstetrical procedure was used.

In the moderately severe and very severe types of retroplacental hemorrhage (Types 2 and 3) the death of the fetus results from the nature of the placental lesion, and the authors believe that operation is not

undesirable risks and the possibility of initiating a secondary bacteriemia cannot be disregarded. Furthermore, a renal carbuncle may develop later in the other kidney.

In the stage of renal carbuncle without perinephritis (if the diagnosis can be made with sufficient confidence at this stage) an argument might be found for nephrectomy, but the loss of a kidney which rarely sustains more than partial damage, and the knowledge that in most cases simple drainage of the secondary perinephritic abscess is an adequate procedure favor conservatism. Local excision of the infected area and free incision into the actual renal carbuncle, even if feasible, are probably as inadvisable as the more active forms of treatment are now commonly held to be in the case of superficial carbuncles.

In the septicemic cases, in which the renal focus is only one of many and organisms persist in the blood, the prognosis is clearly that of the case as a whole.

In the non-septicemic cases, it may be said that there is good cause for conservative handling and no cause for undue pessimism.

HARRY W. PLAGGEMEYER, M.D.

Emmett, J. L., and Kibler, J. M. Renal Tuberculosis Prognosis Following Nephrectomy Based on Pre-Operative Observations in the "Good" Kidney. *J. Am. Med. Ass.*, 1938, 111: 2351.

The indications for nephrectomy in the presence of renal tuberculosis are commonly discussed. Opinion on this subject is unsettled, partly because of the lack of agreement concerning the pathogenesis of the disease. The question today concerns how many of the usual tests should be employed and the finding of what manifestations relative to the so-called uninvolved kidney should be insisted on before the patient is subjected to removal of the involved kidney. For brevity the diseased kidney that was removed at operation will be referred to as the "bad" kidney, while the so-called uninvolved kidney will be spoken of as the "good" kidney.

The records of 1,131 consecutive patients on whom nephrectomy was performed for renal tuberculosis at the Mayo Clinic between the years 1912 and 1932, inclusive, were studied. The results in these cases have been studied from the standpoint of the observations made in the clinical investigation of the good kidney prior to operation. No patients were studied who were operated on after 1932, in order that all cases might be studied from the standpoint of at least five-year survival. Of the 1,131 patients, 453 were known to be dead. To the remaining 678 patients letters of inquiry were sent, and answers were received in more than 70 per cent of the cases. From the information obtained, the following classification of results was formulated:

1. Deaths
2. Patients cured
3. Patients benefited. These were patients whose vesical symptoms had diminished since operation

but in whom vesical symptoms of some kind, even though slight, still persisted.

4. Patients not benefited

5. Condition unknown

The number of cases in which nephrectomy has been performed at the clinic each year since 1912, for renal tuberculosis, indicates a definite reduction in the incidence of this disease. The average age of the patients operated on varied little from year to year during the twenty years of the study and there was essentially no difference in postoperative results among patients of the various age groups. The disease affected almost twice as many males as females. That the disease is far more serious to the male is shown by the fact that in the study of ten-year survivals almost twice as many males as females had died, whereas the incidence of cure among females was strikingly higher than it was among males. The 1,131 patients were divided into four main groups as follows:

Group 1. Patients whose good kidney was not catheterized prior to operation.

Group 2. Patients whose good kidney was catheterized prior to operation, and microscopic examination of the centrifuged ureteral specimen of urine revealed either no pus cells or not more than 3 pus cells per high power field.

Group 3. Patients whose good kidney was catheterized prior to operation and microscopic examination of the ureteral specimen of urine revealed from 3 to 10 pus cells per high power field.

Group 4. Patients whose good kidney was catheterized prior to operation and microscopic examination of the ureteral specimen of urine revealed more than 10 pus cells per high power field.

In an effort to evaluate the importance of investigating the good kidney by the inoculation of guinea pigs and acid-fast staining of the urine obtained by ureteral catheterization, each of Groups 2, 3, and 4 was broken down into Divisions A, B, and C. Division A indicated that guinea pigs were not inoculated and that positive acid-fast stains were not obtained. Division B indicated that guinea pigs were inoculated but that the results were negative and that positive acid-fast stains were not obtained. Division C indicated that either the test by inoculation of guinea pigs or acid-fast staining, or by both methods, gave positive results.

What, then, can be deduced from the information derived from a study of the comparative results in these various groups of cases, and in what way can the deduction assist in the diagnosis and plan of treatment in renal tuberculosis? In the first place, to make a fairly accurate prognosis, catheterization of the good kidney, to determine the amount of pus being secreted, is imperative. A negative urine in such a case leads to a favorable prognosis and the authors' statistical data indicate that the patient may expect approximately a 43.5 per cent chance of a five-year cure, a 65.2 per cent chance of being cured or benefited in that period, and only a 20.3 per cent chance of death within five years. If, in addi-

GENITO-URINARY SURGERY

ADRENAL KIDNEY AND URETER

Ryle J A *Perinephritis Brit J Urol* 1938 10 337

If those inflammations which follow local injury be excepted it may be doubted whether perinephritis is occasioned otherwise than by a direct spread of infection from a metastatic subcapsular abscess of the renal cortex. The infecting organism is usually staphylococcus aureus or more rarely albus. The renal carbuncle to employ the description suggested by Israel in 1890 and revived by Theodore Thompson in 1927 is in other words the precursor of a staphylococcal perinephritis in almost every case.

1 In common with bone muscle (especially the myocardium) skin the lung and the prostate the kidneys have long been recognized by pathologists as the site of election for metastatic abscesses in fatal cases of staphylococcal septicemia.

Perinephritis is a not infrequent association of such a septicemia and may also complicate a bacteremia lacking the clinical manifestations and gravity of a septicemia and is often transitory.

3 There is a history of recent carbuncle or furunculosis or other cutaneous sepsis in upward of 75 per cent of cases of perinephritis. In such cases the renal infection must have been blood borne. The cellular tissues involved are not accepted as a site of election. Surgical exploration shows that the inflammation starts deep in the muscular planes of the trunk and only approaches the surface at a late stage. Although staphylococcal abscesses occur in muscle the frequency of localization in the renal angles would be difficult to explain and muscle abscesses are not in fact encountered in the course of explorations for a perinephric abscess.

4 The abscess or carbuncle sometimes with a discharging crater can be felt with the exploring finger tip in the upper pole of the kidney in a considerable proportion of cases.

In this connection Lihenthal remarked on the not well recognized absence of urinary manifestations in the majority of these cases.

Although attempts were made to support the conception of lymphatic spread of infection the consensus of opinion in the last twenty five years has continued to favor the hemic route. Thompson described renal carbuncle as a rare disease. It is probably much less rare than has been supposed. The author reported additional cases of perinephritis and suggested that the renal cortex is the favorite site for metastatic localization in a staphylococcal bacteremia occurring in adult life. The condition was rarely found in childhood. There was a high preponderance in males. This has been commented upon by others. If osteomyelitis be accepted as the common serious sequel of a staphylococcal bacteri-

emia in childhood renal carbuncle with perinephritis is the common serious sequel in adolescence and middle life.

The interval between the primary infection and the renal metastasis varies from two weeks to two months its average duration being four weeks. A careful inquiry and search for signs of superficial sepsis should be made in every suspected case of perinephritis.

The first localizing symptom in perinephritis is a deep seated pain in the loin or flank or iliac fossa (depending probably on the situation of the renal boil or carbuncle) with aggravation by deep-breathing coughing or by twisting movements as on turning over in bed a maneuver which is always worth observing. One of the author's patients had a renal carbuncle and perinephritis on both sides with an interval of four years between the two conditions.

In a perinephritis on the left side there may be inhibition of the diaphragm with massive collapse of the left lower lobe or there may be shoulder tip pain or a left basal pleurisy with or without effusion. There is evidence that a renal carbuncle with only slight symptoms of perinephritis may undergo spontaneous healing without recourse to surgery becoming necessary. There are no subjective urinary symptoms and in the majority of cases the urine remains normal. There is usually a polymorphonuclear leucocytosis varying in degree but conforming generally with the course of the fever.

From the point of view of both prognosis and treatment it is important to divide the cases into two groups the septicemic and the non septicemic. In the former rigors a quick pulse multiple metastases and an evidently grave illness overshadow the local signs of perinephritis. In the latter rigors beyond an initial chill are unusual the pulse rate remains slow in proportion to the temperature and the renal abscess is usually the only metastasis to be discovered.

As in every other type of suppuration there is an optimum moment for operation. Too early or too late interference may do harm. As a general principle when the symptoms and signs suggest an established collection of pus outside the kidney a deep incision into the loin exploration with the finger and simple drainage are all the measures that are required. It is not uncommon even in the presence of such symptom and signs to find no pus but only a hard indurated condition of the perinephritic fat. Whether or not pus later finds its way along the track improvement may start from this moment. The author has never seen a case in which nephrectomy seemed justifiable. It has been undertaken but usually should not be necessary. In the presence of suppuration around the kidney there are clearly

In the third case, either cystoscopy or ureteral catheterization may be impossible, but urography may furnish information on the function of the kidneys. It is always necessary to include the kidneys and the bladder in the same roentgenogram. If the image does not allow interpretation, it is advisable to improve the condition of the bladder by appropriate treatment in order to permit subsequent cystoscopy.

As the microscopically proved primary bilaterality of renal tuberculosis does not correspond to the large number of cases of clinical unilaterality, the possibility of healing of small lesions of renal tuberculosis is evident. It is therefore necessary to distinguish advanced chronic tuberculosis, which leads to destruction, from the small early lesion, which may heal spontaneously or following treatment.

Treatment of bilateral renal tuberculosis consists of the usual general treatment and of specific treatment, with Vaudremer's vaccine, methylene blue given orally and by instillation, and instillations of gomenolized or phenolized oil. When unilateral healing has been demonstrated by repeated cystoscopies with functional examination of the kidneys, it is often found that the still diseased kidney is in worse condition than previously. Nephrectomy is then indicated. Repeated examinations are necessary in all cases of bilateral renal tuberculosis in order that the opportune moment for surgical intervention is not overlooked.

Five cases are reported to illustrate these statements.

RICHARD KEMEL, M D

Ball, Sir G. Staphylococcal Infections of the Kidney. *Brit J Urol*, 1938, 10 323

Staphylococcal infections of the kidney are relatively rare and when found they usually involve the cortex, although infection of the pelvis is from time to time associated with stone formation. The cortical lesions are hematogenous in origin and are commonly secondary to affections of the skin, such as furuncle and carbuncle, although suppurating foci in other parts of the body may be responsible.

Three types of staphylococcal lesions are recognized: (1) multiple minute abscesses studded throughout the renal cortex, seen in cases of severe acute pyemia associated with such diseases as acute osteomyelitis, (2) a superficial triangular septic infarct, just under the renal capsule, and (3) the lesion commonly found deep in the cortex known as "renal carbuncle," which results in persistent fistula formation after drainage of the perinephric abscess and will not heal until the kidney is removed, or, if it heals, will be followed by a recurrence of symptoms.

The author presents 4 cases to illustrate the clinical course and the difficulty in making a diagnosis of an early lesion. He advises that if a perinephric abscess has already formed, as is most commonly the case, it should be drained in the hope that the whole lesion will heal, but if healing does not occur within a very short period or if drainage of the abscess fails to lead to complete improvement in the

general health of the patient, nephrectomy must be performed as soon as possible provided the opposite kidney is sound.

D E MURRAY, M D

Hyman, A, and Wilhelm, S F. The Differential Diagnosis of Renal and Suprarenal Tumors. *J Urol*, 1938, 40 737

Frequently the first sign of a renal or suprarenal tumor is a palpable mass, with resulting pain in the lower chest, loin, and upper abdomen. Adjacent structures and organs, such as the kidney and the diaphragm, may be dislocated and even infiltrated. The tumor is not uncommonly detected by a shadow in the flat x-ray film, or it may be suspected because of its effect on the position of the kidney, which is displaced downward, mesially, or laterally. Displacement on the left side is particularly significant since the kidney on this side is seldom found out of its usual location. Retrograde and excretory pyelography sometimes reveals compression and distortion of the upper and middle calyces. Slight deformities, such as flattening or absence of a minor calyx, may be the only roentgenographic sign of a large tumor. Excretory urograms are made routinely in both the Trendelenburg and reverse Trendelenburg positions, to show the degree of renal mobility (normally 2 to 5 cm). Fixation of the kidney has been reported in cases of perinephritis and renal suppuration and also of infiltrating carcinoma. Perirenal insufflation has been employed to visualize suprarenal tumors, but it has not been found to be an innocuous procedure, and the information obtained therefrom is often of limited value, and may be misleading.

For practical purposes, the following terms have been adopted: (1) cysts, (2) inflammatory exudate or abscess, (3) neoplasm of the upper renal pole, (4) neoplasm in the suprarenal region, (a) arising from the suprarenal gland, and (b) not arising from the suprarenal gland, and (5) splenic enlargement.

A number of cases are reported. The first was that of a woman, aged sixty-seven years, who complained of pain in the left lower quadrant, sticking pain in the right lower chest, and frank hematuria. The left side of the abdomen was entirely filled by a large, movable, non-tender mass, and a rounded ballotable mass, the size of a lemon, was felt attached to the lower pole of the right kidney. Roentgenography revealed a large circular shadow at the upper pole of the left kidney, and a smaller round shadow near the lower pole of the right kidney. Operation revealed 2 large cysts, one at the upper and one at the lower pole of the kidney.

Case 2. A man, aged fifty-nine, had frank hematuria and the stigmas of eunuchoidism. Roentgenography revealed a stone in the lower pole of the right kidney, cystoscopy revealed bloody urine from the left side, renal function was good, and retrograde pyelography showed downward displacement of the pelvis and some dilatation. A suprarenal tumor was suspected, but operation revealed a large cyst at the upper pole and a calculus in the lower calyx.

tion to this inoculation of a guinea pig gives a negative result and a positive acid fast stain is not obtained his chance of dying within five years will drop to 13.3 per cent his chance of a five year cure will be increased to 50.3 per cent and his chance of being either cured or benefited will increase to 75.2 per cent On the other hand if the guinea pig test is positive the patient's chance of dying within five years increases to 41.8 per cent and his chance of a five year cure drops to 21.8 per cent

The question then arises should a positive guinea pig test corresponding to the good kidney in spite of absence of pus in the urine be considered a contraindication to surgical operation? It must not be forgotten that 21.8 per cent of the patients with such results were cured and that a total of 36.4 per cent were either cured or benefited at the end of ten years Certainly almost any one who had the disease would be willing to submit to operation if given a 30 to 36.4 per cent chance of improvement for from five to ten years

When pus is found in the catheterized specimen of urine from the good kidney the problem is radically altered Because of the small number of such cases in this series it is difficult to make as far reaching statements as have been made concerning the cases in which the urine was microscopically negative However the data suggest that if more than 3 pus cells per high power microscopic field are found and the guinea pig test or the stain is positive the prognosis is poor and it is questionable whether operation is warranted If there is a small amount of pus if the guinea pig test and stains are negative and if the excretory urogram is normal the prognosis seems to be reasonably good and possibly surgical measures are worth the trial

One might well ask whether this study sheds any light on the old arguments concerning the question whether renal tuberculosis is essentially bilateral and whether healing ever takes place in renal tuberculosis Comparing the groups and divisions 2C 3C and 4C it is seen that in Group 2C there is a considerably higher percentage of five and ten year cures in spite of the positive guinea pig test There are fewer five and ten year cures in Group 3C but still a fair number whereas in Group 4C there are no five or ten year cures Group 4C including as it does the cases in which guinea pig tests or stains were positive and a considerable amount of pus was present no doubt represents advanced lesions which probably are those which Thomas would classify as destructive lesions In these cases progress would be expected to be poor The recovery of patients in Group 2C and Group 3C however is not so easily explained No doubt the positive finding in some cases is due to the reflux of vesical urine up the ureter or it may be attributable to the catheter as it is passed through the bladder picking up bacteria and pus However certainly some of these cases must have been true cases of bilateral renal tuberculosis That the lesion in the kidney became quiescent or healed clinically seems probable although of

course a conclusion cannot be reached unless the kidney is examined microscopically It is believed that on the basis of the statistics which are drawn from a relatively large group of cases it should be possible for the physician after a complete study of the good kidney including urography to give his patient a fairly accurate prognosis

Van Der Vuurst De Vries J H J The Usefulness or the Necessity of Subsequent Examinations of Patients in Whom Bilateral Renal Tuberculosis Has Once Been Found (D'utilité ou de la nécessité des explorations successives chez les malades chez lesquels on a constaté à un moment donné une tuberculose rénale bilatérale) *J drol méd et chir* 1938 46 526

Microscopic examination of cases in which the circulation of tubercle bacilli are found circulating in the blood has shown that renal tuberculosis is always bilateral and that the so called tuberculous bacilluria of a healthy kidney does not exist The diagnosis of bilateral renal tuberculosis requires the presence of a number of well known symptoms and imposes the necessity of cystoscopy with a separate collection of urine from each kidney especially when most of the symptoms are absent Cystoscopy may reveal tuberculous lesions of the bladder principally around the ureteral orifices but their absence does not disprove the presence of renal tuberculosis Cystoscopic examination offers three possibilities both ureters can be sounded only one ureter can be sounded and neither ureter can be sounded

In the first case the presence of pus and of tubercle bacilli demonstrates bilateral renal tuberculosis while the urea and chloride concentration and the percentage of elimination of phenolphthalein indicate the degree of involvement of each kidney When tubercle bacilli cannot be demonstrated for one kidney which discharges pus and shows a decrease in function bilateral renal tuberculosis is probable The phenomenon of inhibition may offer difficulties but it occurs only in a healthy kidney urography or repetition of the functional examination a few days later will prevent errors of interpretation Bilateral pyelography will reveal the extent of the lesions

In the second case the diagnosis of the non-catheterized side becomes more uncertain because the urine of this kidney must be collected by means of the vesical catheter and various sources of error may be present (vesical lesions admixture of urine of the contralateral kidney epididymitis or vesiculitis) However the results of the functional examination may guide the diagnosis if the rates for the urine collected by the vesical catheter are decidedly higher than those obtained for the catheterized kidney the lesions of the former kidney are less serious than those of the latter while if the rates are about equal or lower than those obtained for the catheterized kidney the lesions are bilateral and it is even possible that the function of the former kidney is totally abolished Pyelography of the catheterized side is always indicated

In the third case, either cystoscopy or ureteral catheterization may be impossible, but urography may furnish information on the function of the kidneys it is always necessary to include the kidneys and the bladder in the same roentgenogram. If the image does not allow interpretation, it is advisable to improve the condition of the bladder by appropriate treatment in order to permit subsequent cystoscopy.

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Case 2. A man, aged fifty-nine, had frank hematuria and the stigmata of eunuchoidism. Roentgenography revealed a stone in the lower pole of the right kidney, cystoscopy revealed bloody urine from the left side, renal function was good, and retrograde pyelography showed downward displacement of the pelvis and some dilatation. A suprarenal tumor was suspected, but operation revealed a large cyst at the upper pole and a calculus in the lower calyx.

Case 3 A man aged sixty eight complained of constant pain in the left loin nocturnal cloudy urine and frequent attacks of chill and fever. Examination revealed marked shock tenderness in the left renal region. X rays showed the left kidney to be enlarged and low in position and retrograde pyelography revealed marked ptosis and flattening of the upper calyx which suggested an extrinsic mass above. The left kidney appeared fixed. Perirenal insufflation showed absence of air above the kidney. Operation revealed an abscess cavity.

Case 4 A man aged fifty five complained of pain on the right side weakness loss of appetite and marked loss of weight. The abdomen was distended and a superficial fluctuating mass was felt in the right lumbar region. There was moderate shock tenderness over the right loin and moderate fever. X rays showed obliteration of the right psoas shadow and slight lumbar scoliosis with the concavity to the right. Pyelography revealed downward and inward displacement of the kidney with normal pelvis and calyces. The ureter was also displaced medially. A retroperitoneal abscess was diagnosed and was found at operation extending upward to the diaphragm.

Case 5 A woman aged forty one had pain in the right loin and intermittent hematuria. A ballotable mass was felt in the right upper quadrant and loin with slight costovertebral tenderness on the right side. Renal function on the right side appeared diminished. Pyelography revealed downward displacement of the right kidney and absence of the upper and middle calyces. Since the patient had previously been operated upon for retroperitoneal fibrosarcoma involving the left ovary a diagnosis of metastatic fibrosarcoma in the supra renal region (either displacing or infiltrating the kidney) was made. At operation a sarcoma of the upper pole of the kidney was found to be extending into the renal vein and vena cava. Pathological examination revealed a spindle cell sarcoma.

Case 6 A man complained of pain on the left side of the abdomen and back of night sweats and moderate fever for a period of three weeks. A hard resistant ballotable mass was found in the left lumbar region and in the left upper quadrant. Retrograde pyelography revealed deformity of the upper calyces with flattening. The left kidney showed some mobility. Operation revealed an entirely retroperitoneal mass arising from the upper pole of the left kidney. Section of the tumor showed the Grawitz type of clear cell carcinoma with involvement of the renal vein.

Case 7 A woman aged forty two had suffered pain in the right loin which radiated to the groin for a period of one year. Two years earlier she had noticed a lump in the right lumbar region which had increased in size. She also had frequency of urination. A hard fixed mass was felt just below and apparently adherent to the right twelfth rib in the anterior axillary line. There was a hard irregular somewhat tender ballotable mass in the right side

of the abdomen extending from the costal margin to the iliac crest. X rays revealed a large calcified mass in the right upper quadrant displacement of the kidney medially and downward and compression of the pelvis and calyces. Operation revealed the presence of a huge retroperitoneal osteochondromyxosarcoma.

Case 8 A woman aged thirty felt a constant boring pain in the left loin for months but had no urinary symptoms. The left kidney was palpable but was neither tender nor enlarged. The cystoscopic findings were negative. Pyelography revealed ptosis of the left kidney with fixation. Operation revealed a low kidney with a hard tumor mass directly above it but distinctly separated. The neoplasm was obviously malignant and inoperable since it proved to be a clear cell carcinoma with necrosis.

Case 9 A man aged twenty three had pain in the left flank and fever. Pyelography showed a stricture of the lower ureter and absence of the superior calyx. The urine was bloody and moderate fever was present. Ureteropyelography showed dilatation of the ureter and an abscess of the superior calyx. Colon bacilli were found on culture of the urine. Renal tuberculosis was diagnosed and upon operation a firm adherent mass was found at the upper pole. Pathological examination revealed a pheochromocytoma invading the upper half of the kidney.

Case 10 A woman aged fifty complained of pain in the right side of the abdomen radiating to the hip the lumbar region over the sacrum and the lower chest. She complained also of weakness dyspnea and nausea. A large mass was palpated in the right upper quadrant. Pyelography revealed marked downward displacement of the right kidney by a large mass above it. The renal function and outline were normal. The calyces were normal except that there was slight dilatation of the lowest one. At operation a large inoperable carcinoma arising from the cortex of the right suprarenal gland was found.

Case 11 A man aged sixty five complained of loss of weight recurrent hemorrhoids and chronic constipation. A left abdominal tumor was felt about one year previously. There was slight nocturia but no other genito urinary symptom. A large smooth non tender mass was felt in the left side of the abdomen. The mass moved with respiration and a distinct notch was palpable. The liver was palpable and smooth. The left epigastric vein was prominent. Urinalysis was negative except for a trace of albumin and rare leucocytes. Pyelography revealed considerable downward and medial displacement of the left kidney by a large mass which could be seen above. The pelvis and calyces were lightly dilated. Urine from the left kidney showed few leucocytes and many erythrocytes. The final diagnosis was cirrhosis of the liver with marked splenic enlargement which dislocated the kidney.

LOUIS NEUWEIT M.D.

Hunner, G L Intussusception of the Ureter Due to a Large Papilloma-Like Polypus *J Urol*, 1938, 40 752

A case presenting two features which are unique in urological literature, intussusception of the ureter and polypoid tumor of the ureter, is presented

A woman, aged thirty-three years, had attacks of pain in the region of the right mid-anterior flank for four years which recurred at monthly intervals. Palpation over the lower pole of the right kidney elicited tenderness, as did pressure over the right ureter at the pelvic brim. There was tenderness over the right ureter in the region of the broad ligament. The urine was normal except that it contained a considerable amount of albumin. Cystoscopy revealed a normal bladder except for the right ureteral orifice, which was large, and the presence of a papilloma-like mass with a pedicle and glistening finger-like branches. Catheterization of the right ureter showed complete blockage at about the level of the pelvic brim. Urography showed two small areas of increased density in the ureteral line just to the right of the fourth lumbar vertebra. The catheter tip rested at about 1 cm below the dense shadows which were interpreted as ureteral calculi. The right kidney was in good position and of about normal size, but none of the sodium iodide passed the level of the catheter tip. There was some dilatation of, and some convolutions in, the lower abdominal ureter. The pelvic ureter was widely dilated and its lumen was occupied by a mottled, feathery shadow, suggesting that the papillomatous condition had originated from a large ureteral tumor mass. The papillomatous mass projecting from the ureter was fulgurated. Attempts to pass a renal catheter beyond the obstructing area (supposedly harboring the ureteral calculi) failed. Intravenous urography nine months later failed to show the shadows that were suggestive of stones, and it was concluded that they had passed spontaneously. However, the intermittent attacks of pain persisted.

The subsequent examination revealed the right kidney to be palpable over its lower third, of normal size and mobility, but moderately tender. There was tenderness and a desire to void on pressure over the right ureter at the pelvic brim. Pressure over the lower ureters in the broad ligament regions revealed marked tenderness and a desire to void. Vaginally and rectally, no unusual resistance was detectable. The urine was practically clear and contained no unusual clumps suggesting fingers of papilloma. Cystoscopy revealed no papilloma implants in the bladder. The right ureteral orifice appeared normal, but there was a bullous edema nodule just to the median side of the orifice. There was some prominence of the ureterovesical wall just back of the orifice, but this was not prominent enough to arrest attention had it not been for the previous ureterogram suggesting a distention of the lower ureter with a tumor. A 15 F dilating bougie could be passed 24 cm beyond the external ureteral orifice, but returned with a long curve in the distal end as



Fig 1 A, Drawing of gross specimen, kidney bisected, ureter opened over region of intussusception B, Ureter opened to show mechanism of the intussusception, base of the tumor attached to neck of intussusceptum, adhesions connecting neck of intussusception to posterior wall of the intussusciens C, Cystoscopic appearance of ureteral orifices with patient in knee-breast position

though it had doubled back on itself. A ureteral catheter with a 15 F wax bulb was then placed about 12 cm back of the tip and soon after the bulb disappeared within the ureteral orifice the catheter was abruptly blocked. The intravenous differential phthalein test showed normal values. Fluids introduced into the catheter for urography refluxed rather

promptly through the bladder catheter showing that little or none of the injection reached the kidney. The catheter tip apparently had been blocked by a ureteral convolution (Fig 1) somewhat above the pelvic brim and some of the solution had passed the tip for about 3 cm but passage was completely blocked near the lower edge of the fifth lumbar transverse process. At the upper edge of the fifth transverse process there were two small dense shadows similar to those seen previously and interpreted as ureteral calculi. The pelvic ureter was widely distended and showed the same mottled appearance seen previously. Later cystoscopy still revealed no evidence of papilloma implants in the bladder. The right ureteral orifice opened from 2 to 4 mm in diameter with each peristaltic wave and occasionally a small pale jelly like polypoid mass projected through the orifice just beyond the level of the bladder mucosa.

At operation a complete aseptic nephro-ureterectomy through two relatively short incisions (Edwin Beer method) was done followed by an uneventful convalescence. Figure 1 presents the appearance of the removed specimen. Only after the mid portion of the ureter was opened was it realized that this was a case of intussusception of the ureter. The invagination was due to the drag of an unusually large papilloma like tumor. Microscopically this tumor was a pure polypus. The history of intermittent attacks of moderate pain for four years suggests that the intussusception was of long standing. The tumor plus the intussusception had led to astonishingly little damage to the kidney. Had the ureter been explored first the rather solid feeling mass at the site of the intussusception with dense adhesions surrounding the ureter in this region would have suggested the diagnosis of probable malignancy and the entire tract would have been removed from below upward—a distinctly more difficult procedure.

LOUIS NEUWELT MD

The procedures for lesser degrees of hypospadias and for epispadias are also illustrated in detail. Pressure dressings are used after each step.

ANDREW McNALLY MD

Hansson C J *Cancer of the Penis and Its Treatment* *Acta radiol* 1932 19 443

The author analyzes the cases of 73 patients who were accepted for treatment at the Radiumhemmet Stockholm out of the 106 who presented themselves during the years of from 1912 to 1937. Of the 73 patients treated 27 were seen within the past five years and therefore their cases are not included in the discussion of the results of treatment. These cases are divided into three groups based on the findings in the regional lymph nodes at the beginning of treatment.

Group I Cases without clinically demonstrable lymph node metastasis. This group comprises 27 patients 23 of whom are symptom free after five years. Treatment in this group varied from irradiation only to amputation with dissection of the lymph nodes followed by irradiation of the surrounding region.

Group II Cases with clinically demonstrable lymph node metastasis when the cancer is clinically limited to the nodes. There were 12 patients in this group with 7 patients symptom free for five years. The same kind of treatment was used as for Group I with satisfactory results only from the more radical type that is amputation with dissection of the lymph node areas followed by irradiation.

Group III Cases with lymph node metastasis when the cancer has begun to break through the lymph node capsule. There were 7 patients in this group in all of whom the treatment was merely palliative.

The author stresses the fact that combined surgical and radiological therapy offers the greatest prospect of success.

ANDREW McNALLY MD

BLADDER URETHRA AND PENIS

Blair V P and Byars L T *Hypospadias and Epispadias* *J Urol* 1939 40 814

The authors describe their method of plastic repair which has in their hands most nearly reproduced the natural condition reduced the average number of steps of operation and eliminated much of the uncertainty of the results.

The article is fully illustrated and the technical details can be obtained from the illustrations and the accompanying legends.

The operative plan consists of three steps:

1. The correction of the deformity and the freeing of the corpora cavernosa. The ventral skin defect is covered by skin from the dorsum and lateral surfaces of the penis.
2. The urethra is formed from this transposed skin and covered with skin from the scrotum.
3. The penis is freed from the scrotal flap and the urethra completed.

GENITAL ORGANS

Moszkowicz L *False and True Cryptorchidism* (*Ueber falschen und echten Kryptorchismus*) *Arch f Klin Chir* 1938 192 209

The disagreements in the literature with respect to the genesis and the treatment of cryptorchidism are attributed to the fact that quite different conditions have been included under the term cryptorchidism. A differentiation must be made between true and false or pseudo cryptorchidism. In the latter we are dealing simply with a residual patency of the processus vaginalis through which the small testicle is able to hide back and in the presence of excessive adiposity (especially in the temporary type of adipogenitalis) the testicle may become completely hidden. At the time of puberty such testicles usually tend to become larger and then descend spontaneously to the normal position. Furthermore such testicles which ordinarily are not hypoplastic tend to undergo volvulus and necrosis.

In these cases operation may be deferred until the time of puberty when these testicles can easily be brought down to the proper position

In contradistinction to this condition, in true cryptorchidism the testes are primarily undeveloped and can be brought down only with great difficulty or not at all. Now since both forms are, ordinarily, not differentiated the operative results are reported with great variation. Ideal permanent results, in 80 per cent of the cases, as well as highly unsatisfactory results have been reported. It may be mentioned right at this point that the endocrine treatment up until the present time has not yielded any uniform results.

The author then enters into a prolonged, richly illustrated discussion of the descensus, the inhibition of the latter in both the female and the male embryo by means of intersexuality, and the relationship of the descensus to hermaphroditism, eunuchoidism, and infantilism. The development of true cryptorchidism is explained on the basis that the male differentiation has passed through a female developmental phase in an abnormal manner, and a ligamentum latum was formed which causes both of the testicles to become fixed to each other, this developmental abnormality can be demonstrated anatomically. The findings in tumor formation in the undescended testicle are notable. Formerly, it was assumed that a dystopic testicle underwent malignant degeneration more frequently than the normally situated one. This conception has been disputed in recent times. However, an unequivocal decision of this question, according to the author, is possible only if the clinician from now on is care-

ful to differentiate between true and false cryptorchidism.

From the anatomical point of view, de Barry and Fischer-Wasels (1933) maintain that the retained organ is the seat of a malignant neoplasm from 150 to 200 times as frequently as the normally situated one. Very important is the fact that most of the tumors are found in a particular group of individuals who possess the characteristics of the intersexual type. It is strongly recommended that the name dysgerminoma (Robert Meyer) be introduced to designate this type of tumor. The term seminoma is refuted.

In false cryptorchidism, treatment may be deferred until the time of puberty. In the cases of inguinal hernia, conservative operation is indicated, but not too early. In true cryptorchidism, the hypoplasia of the testicle can be improved neither by operation nor by endocrine therapy. In spite of this, operation should be performed (orchidopexy). If operation proves unsuccessful in bringing the testicle down and fixing it, the testicle should never be replaced into the abdomen but should, if the condition is unilateral, be removed because of the danger of malignant degeneration.

In many cases of cryptorchidism potency and the libido may be either altered or normal, and occasionally they are increased. Marriage can hardly be interdicted, however, the partners in marriage should be informed concerning this condition, that it is a symptom of degeneration, and hereditary, furthermore, that the male partners (even in the cases of unilateral involvement) are often sterile.

(ROEDELIIUS) HARRY A. SALZMANN, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Geschickter C F and Maseritz I H Ewing's
Sarcoma *J Bone & Joint Surg* 1939 21 25

The roentgenographic appearance of Ewing's sarcoma afforded a comparatively positive means of diagnosis in more than 70 per cent of the 135 cases used as the basis of study for this report on the diagnostic features of Ewing's sarcoma. The diagnosis in the last analysis necessarily depends upon the microscopic findings.

The roentgenographic appearance of Ewing's sarcoma and subacute and chronic osteomyelitis may resemble each other very closely. The combined effects of bone destruction, periostitis and reactive bone formation in osteomyelitis produce many roentgenographic findings similar to those seen in Ewing's sarcoma. Ewing's sarcoma is an invasive tumor which tends to extend longitudinally along the shaft of bones; it invades the medullary cavity and destroys the bone spicules. In response to this invasion and destruction, new bone is laid down subperiosteally and subendosteally. The tumor tissue possesses no properties of osteogenesis. The ratio of bone destruction and new bone formation is variable and inconsistent. This produces variable roentgenographic appearances. The so-called onion peel formation in Ewing's sarcoma is the result of multiple parallel rows of reactive bone separated by tumor tissue. Often the extent of bone reaction is proportionally greater than the speed of tumor growth, which results in a broad sclerotic shaft. The cause of sclerosis is an encroachment of the reactive bone on the soft tissues surrounding the cortex and on the medullary cavity which tend to become obliterated. The tumor tissue will often overcome this defensive mechanism and grow outward from the periosteal covering, forming a soft tissue mass which is surrounded by a thin wall of connective tissue. Transverse striations may develop. Great similarity is often found in such clinical factors as age, sex, race, mode of onset, duration of symptoms and physical finding. Biopsy studies are frequently necessary to make the diagnosis.

Roentgenographic appearances of sclerosing osteogenic sarcoma seldom present serious difficulties in a differential diagnosis from Ewing's sarcoma because the roentgenographic appearance of patchy sclerosis and irregular ossification in the periosteal zone are sufficiently constant in sclerosing osteogenic sarcoma to be considered pathognomonic. The roentgenographic changes in early growths do not present these features so distinctly, but they are sufficiently characteristic that they can be distinguished from the changes in Ewing's sarcoma. The bone involvement in sclerosing osteogenic sarcoma is usually confined to a limited area of the distal portion of a

shaft and gives one the impression of a tumor formation. This is not true of Ewing's sarcoma, which most often involves from one third to one half of the shaft. The transverse striations that are occasionally present in Ewing's sarcoma are fine hairlike and resemble groomed whiskers; those seen in sclerosing osteogenic sarcomas are coarse and do not have the groomed appearance.

Osteolytic osteogenic sarcoma can usually be differentiated from Ewing's sarcoma by roentgenographic examination. The roentgenographic changes in chondrosarcoma simulated Ewing's sarcoma or osteomyelitis in several instances.

Microscopic and roentgenographic differential diagnostic features are discussed for other bone tumors. Photographs of roentgenograms and photomicrographs are presented.

The many microscopic forms of Ewing's sarcoma are apparently the results of variations in growth and in blood supply rather than varying modes of histogenesis.

The individual tumor cells were found to vary as frequently as the mode of growth. The most common type encountered was the small or moderately large round or oval cell with little or no obvious cytoplasm. The reticulum cell was second in frequency; the spindle type of endothelial cell was third; and lymphocytic and myelocytic types were rare.

The prognosis is grave. Death occurred in 94 per cent of the cases in this series. The greatest problem is early and accurate diagnosis, which can be definitely determined only by biopsy. Irradiation as a therapeutic test should precede biopsy. Resection of the entire shaft, when possible in proved cases, is the operation of choice except in the weight-bearing bones of the lower extremity, where amputation is advised. ROBERT F. MONTGOMERY, M.D.

Ortlepp H. Epicondylitis Humeri (Ueber Epicondylitis humeri). Kiel Dissertation 1938.

Vuillet published an article entitled "L'epicondylite" in *Semaine méd.* 1909 No. 22. In Germany Franke followed with his paper "Ueber Epicondylitis humeri" in *Deutsche med. Wchnschr.* 1910 Nos. 1 and 9. The lesion is found usually on the lateral side of the humerus, seldom on the medial epicondyle. Frequently a mild swelling in the form of a circumscribed edema and tenderness to pressure may be demonstrated. A tugging pain is elicited by pressing down upon the closed fist with the wrist held in dorsiflexion and the elbow completely extended. Active extension however may be limited to 160 degrees; extreme flexion may likewise be painful. The intermediate range of motion is free. A periosteal thickening is found roentgenologically only in more chronic cases, using oblique views and projecting the plane of the lateral epicondyle.

Vuillet believes that repeated hyperextension of the muscle groups arising from the epicondyle causes the lesion. In addition, nerves, periosteum, bursae, joint capsule, cartilage, and bone become involved. Thomsen wrote, "If it is now a fact that in all cases of epicondylitis humeri passive motion of the hand with fingers extended, almost without exception, elicits no pain at the epicondyle and that, on the contrary, the same motion with the fist closed and the fingers in maximum flexion often causes very marked pain at the epicondyle, it demonstrates significantly that the extensor digitorum communis is primarily involved." Following Hohmann's operative procedure for such cases, Thomsen removed sections of muscle, in which Klinge demonstrated a definite microscopic picture of chronic inflammation. In 1910 Francke recommended chiseling off the epicondyle, in 1926 Fischer advocated cutting away the pain-producing periosteum. At the 21st congress of the Orthopedic Society Hohmann stated, "Through a small incision, I made a notch into the bone directly over the lateral epicondyle, and so relieved a genuine tension, while lengthening this portion of the muscle." Thereafter all complaints vanished. No loss of strength occurred. In the other cases he did not strip the entire condyle of muscle, but only the anterior projection and the groove lying laterally to it, the site of the greatest pain. Ten days of nursing must follow. Hohmann reported 4 cases, and in 1930, a total of 12 cases, in 11 of which results were immediately proved. Mau recommended this operation on the basis of 4 cases with follow-up. Boshammer and Thomsen also advocated this operation. On the other hand, Halla warned against keloid formation and delayed healing. The small number of published operations indicates that to the greatest extent treatment was conservative. Rest by use of a plaster or Cramer splint, baking, and massage also achieved results, Ortlepp treated 24 cases in this manner. If from four to six weeks of conservative therapy fail, the operation should be considered.

(PLENZ) JEROME G. FINDER, M.D.

Testa, G. Disease of Sinding Larsen and Johansson (Malattia di Sinding Larsen e Johansson) *Radiol med*, 1938, 25: 1081

About 30 cases of the Larsen-Johansson lesion are found in the literature. Testa describes 2 new cases in boys, aged thirteen and eleven years, respectively. The disturbance appears about the age of puberty (average age, twelve years) in children of normal development and of active life, generally without previous or coincidental trauma. The onset of the disorder is slow and gradual, marked by vague, intermittent, slight pains which do not interfere with function, but which are aggravated by physical exercise; they are practically never intense enough to force abstention from all activity and they usually involve only one knee. When both sides are involved, roentgen examination may reveal the presence of a dystrophic disorder, such as the lesions of



Fig 1 Fig 3 Fig 2 Fig 4

Figures 1 and 2 Female, aged six years, healthy. Patella of granular aspect, with dentations and fringes of the anterior contour.

Figures 3 and 4 Normal images

Osgood-Schlatter or of Legg, Calvé, and Perthes. Generally, the apex of the patella and the point of attachment of the ligament are the seat of maximal pain and the initial symptoms have usually been present from two to six months before the patient comes under observation. A swelling may be found at the upper attachment of the patellar ligament or at the sides, and palpation or percussion at this point may reveal tenderness, but usually the subjective signs are slight. Active and passive movements are well conserved and the general condition is good. The disorder responds quickly to rest and immobilization and complete cure is obtained in from forty to sixty days.

Roentgen examination must take into account the age of the patient because ossification of the patella proceeds regularly even in the presence of remissions or recurrences of the clinical symptoms. However, the reported roentgen signs are unreliable because they may be found also in normal ossification of the patella; they have been found in children two or three days after injury and they are found on both sides in the same subject in whom the clinical symptoms are unilateral. The irregularities of the anterior patellar contour accepted as signs of erosion or destruction, the frontal or fronto-apical osseous lamella considered as a sign of periosteal reaction, and the more or less regular isolated nodule at the patellar apex are also found in the ossification of the normal subject (10 to 15 per cent). Besides, ossification presents marked differences as to time of appearance of the first osseous nucleus in the two sexes, and lobulated aspects with irregular contours are common in the first stages, as well as apical and frontal incisures and isolated nodules which may persist until the age of fourteen or fifteen years. It is consequently necessary to fall back on the histopathological findings and the clinical examination in the presence of a roentgenologically demonstrable accessory apical nucleus with osteochondrodystrophic disturbances which may predispose to abnormal irritative reactions under the influence of ordinary mechanical factors.

Histological examination excludes inflammation of tendon or bone and shows only slight infiltration of the vascular walls, some irregularity in the distri-

bution of the cartilaginous cells and in the presence of osteoid tissue and in one case aseptic necrosis of some osseous trabeculae these characteristics belong to the lesion of Osgood and Schlatter which seems to be present in 38 per cent of the reported cases. Clinically there is also great similarity between the two disease forms in the matter of age incidence benignity duration remissions and recurrences. The disease of Larsen and Johansson is a syndrome in the pathogenesis of which must be considered mechanical causes acting as factors to produce chronic irritation of the patellar tendon and its osteocartilaginous plane of attachment its causes are of circulatory character and are related to disturbances of nutrition. The accessory apical osseous nucleus is present before the clinical signs appear and favors the mechanical actions.

RICHARD KEMEL, M.D.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

Berard and Bourdillon. Conservative Treatment of Pott's Disease in Children and Adolescents at the Hôpital René Sabran from 1931 to 1938 (*Le traitement conservateur du mal de Pott chez l'enfant et l'adolescent à l'hôpital René Sabran de 1931 à 1938*). Lyon *chir.* 1938, 35, 666.

Berard and Bourdillon report that at the Hôpital René Sabran at Lyons 118 children and adolescents with Pott's disease had been treated from January 1931 to May 1938 of these 70 had been discharged and 48 were still under treatment at the time of their report May 1938. Of the 70 patients who had been discharged from the hospital 52 had been treated conservatively without operation.

The lumbar vertebrae were involved in 42 per cent of these 52 cases the thoracolumbar vertebrae in 8 cases and the thoracic vertebrae in 13 cases. In most cases the disease had developed in early childhood before the age of five years in 31 cases. Most of the patients were sent to the hospital while the disease was in an active stage with the bone lesions well developed only rarely were patients seen in the early stage a few cases were seen after the activity of the disease had subsided presenting only orthopedic sequelae (deformity gibbosity) or chronic suppuration and old fistulas. There were 10 patients in this chronic group. Of the 42 patients in the active stage of the disease 9 had fistulas 11 had Pott's disease associated with other tuberculous lesions 22 had Pott's disease without other tuberculous lesions. Of the latter group only 8 had extensive lesions involving 3 or more vertebrae.

The therapy employed in these cases combined outdoor and sun treatment with conservative orthopedic measures. Lyons has a seaside climate and is protected from north wind by mountains. The sun treatment was carried out according to Rollier's method with gradually increasing exposures to the sun until the whole body was exposed—the duration of the exposures depending in each case on the pa-

tient's reaction as to temperature weight and appetite. The duration of the sun bath never exceeded two or three hours and in the summer was still less. If the patients had fever the sun treatment was suspended until the temperature became normal. The orthopedic treatment consists in strict immobilization of the spine in the correct position. As a rule the plaster bed of Calvé and Galland is employed with minor modifications. Toward the end of the period of immobilization the patient is allowed to assume the ventral position for certain periods each day at meals and during the sun treatment. He is not allowed to get up until there is both clinical and radiological evidence of cure. Clinical evidences of cure are absence of pain and stiffness of the spine with the development of slight compensatory curvatures above and below the involved vertebra. Radiologically there is recalcification of the involved bone which in the most favorable cases may result in a reconstitution of the spine and integrity in other cases in a complete bony ankylosis of the vertebral bodies involved and in still others in an incomplete ankylosis with reappearance of the outline of the intervertebral discs. This reappearance of the discs above or below the disease focus is a good sign of healing. The decision as to whether the child should wear an orthopedic corset after the period of complete immobilization depends upon the radiological findings. If there is a good bony callus or a *resitutio ad integrum* such a corset is not necessary if however there is only a partial ankylosis or a considerable loss of substance a corset should be worn eighteen months or more. In association with heliotherapy and orthopedic treatment in these cases a general medical treatment with cod liver oil or calcium gluconate given by injection is advised especially during congestive exacerbations.

The results in these 52 cases as determined by a re-examination of the patients two or more years after discharge or by a satisfactory report from the parents are as follows:

In the 10 patients with non active chronic lesions there has been no change since discharge. Of 9 with fistula 2 were cured 3 showed no change and 4 have died. Of 11 patients with associated tuberculous lesions 3 are cured 3 show no improvement 2 have grown worse and 3 have died. Of the 22 patients with Pott's disease without associated lesions 19 are cured (including all the 13 with a localized lesion) 2 present evidence that their condition has become worse and 1 has died. From these results the authors conclude that for patients with Pott's disease with active tuberculous lesions wherever the Mediterranean climate is not as favorable as the mountain climate and the Alpine sun. With uncomplicated Pott's disease however the sun treatment and the Mediterranean climate combined with conservative orthopedic methods appears to be the method of choice. Operative osteosynthesis is an adjuvant in certain selected cases.

ALICE M. MEYERS

FRACTURES AND DISLOCATIONS

Giangrasso, G. The Accelerating Action of Vitamin C on the Healing Process of Fractures (Azione acceleratrice della vitamina C sul processo di guarigione delle fratture) *Polichin*, Rome, 1938, 45 sez prat, 2279

The metabolism of ascorbic acid in man is very active an adult needs from 20 to 30 mgm of this substance per day, of which he eliminates 10 mgm in the urine. Vitamin-C deficiency leads to various disturbances, among which may be mentioned changes in the teeth and bones and a tendency toward hemorrhage. The metabolism of the bones is altered, disintegration of the cartilaginous cells is followed by osteoporosis and a tendency to fracture. Because of the curative action of Vitamin C in many diseases, the stimulation it exercises in many repair processes, and its specific action on the metabolism of the bones, Giangrasso determined to find out whether and how this substance influences the healing process of fractures.

All patients with fractures were examined to determine whether they were suffering from pre-existing or coexisting diseases, nearly all fractures were reduced under anesthesia, a plaster-of-Paris apparatus was applied in all cases, but complementary traction or surgical reduction was also needed in some of the cases. Roentgen examination was made on admission, after the fracture was reduced and then from time to time in order to follow the various stages of the process of repair. Vitamin C was given by the subcutaneous route 50 mgm, equivalent to 1,000 international units, were given immediately after reduction of the fracture, and 100 mgm were given every three days thereafter until healing was complete. Children were given one half of this dose.

Among a number of cases treated, only 3 are described which presented serious complicated fractures and were cured in about half the time usually needed for the healing of this type of fracture. In the second case, the dystrophic results of a progressive acute anterior poliomyelitis constituted another unfavorable factor. It is to be noted that fractures in both sexes and all ages are benefited by the administration of Vitamin C, which, in addition, neutralizes the deleterious action of some diseases on the formation of the osseous callus, for example, syphilis. The mode of action of Vitamin C in this case may be explained by the hypothesis that, as the essential localization of syphilis is in the walls of the blood vessels and as Vitamin C increases the vascular resistance by stimulating the elaborative capacity of the intercellular cementing substance of the vascular endothelium, Vitamin C neutralizes or at least compensates for the damage caused by the syphilitic infection.

RICHARD KEMEL, M D

Plaut, H F Fractures of the Atlas Resulting from Automobile Accidents *Am J Roentgenol*, 1938, 40 867

Present-day traffic hazards increase the incidence of fractures of the atlas. Such injuries are not as a

rule the result of direct violence but are produced indirectly through the mechanical forces acting on the skull and spine. The anatomy, ossification, and variations of the first cervical vertebra are discussed by the author, following which 6 cases of fracture of the atlas are reported. The author has collected from the literature 99 cases of injury of this kind. Without an autopsy or at least a post-mortem roentgen examination, a more exact diagnosis is hardly possible in cases in which the injury is so extensive that death follows instantly. The opportunity to diagnose a fractured atlas with the help of roentgenograms is now greater than before the roentgen era. Direct trauma to the atlas is a rare accident. Fixation of the head and spine by contraction of the musculature plays a definite rôle.

In Table I of the original article the cause of the condition is given in 34 cases. The mechanism of the fractures is described. The author believes that blunt violence against the skull is the cause of atlas fractures almost without exception and that the 3 different mechanisms are the atlantal squeeze, the lever-like action on the posterior vertebral arch, and the pressure of the odontoid against the anterior arch.

Table II gives the site of fractures in 88 cases. Associated injuries are represented by symptoms of skull fracture in the vault or base. More dangerous are those injuries loosening the anchorage of the first cervical vertebra.

Table III cites 75 complications. The medulla is seldom affected by fractures in its immediate neighborhood. If there are symptoms they range from "tingling" in the arms to sudden death. Coincident injuries are more frequently responsible for the majority of cord injuries than a separation in the atlas. Neuralgias with sensory disturbances in the region of the great occipital nerve are common.

In Table IV-A the author cites the nature of the accident, clinical signs of cord or nerve injury, the anatomical diagnosis, and results in 40 cases of isolated fractures of the atlas.

In Table IV-B he cites the same facts pertaining to 59 cases of complicated fractures of the atlas. General stiffness and pain in the neck, chiefly in the suboccipital region, are the main symptoms. The head may be held with both hands to prevent suffering from involuntary moments. Active flexion and extension during occipito-atlantal rotation and in the atlanto-axoid joints, and lateral inclination are inhibited by pain, and nodding may separate the fragments and elicit pain. Passive movements may hurt extremely and be somewhat limited. There is tenderness on palpation of the nuchal groove and also over the transverse process. Swallowing may be painful. The roentgen technique and findings are described in detail. Among conditions to be ruled out in the differential diagnosis are malformations, traumatic and spontaneous dislocations of the atlas, and injuries to the remainder of the cervical spine. Arthritis, osteomyelitis and tuberculosis, tumor, metastases, and diseases of the nervous system must be considered in the differential diagnosis. Treatment

is also described with special emphasis on immobilization plaster casts traction and eventual operation. The treatment of complications is not discussed. Mortality and end results are discussed, the author stating that the fatal results in recent years amount to only 9 per cent in fractures of the atlas. An overwhelming majority of the patients recover to full occupational activity. EML C ROBINSHAK M D

Griswold R A Goldberg H and Joplin R
Fractures of the Humerus *Am J Surg* 1939
43 31

The authors use the traction cast first advocated by Caldwell as a means of fixation with traction which in their hands has proved effective in the treatment of 128 cases of fracture of the humerus. Results were superior to those obtained with any other method.

Following gross reduction by manual traction and manipulation a cast weighing from 3 to 4 lbs is applied from the knuckles to the axilla. The forearm is placed in a position perpendicular to the line of the distal fragment and usually in semi pronation. A sling about the neck suspends the cast from a plaster loop at the wrist the effect being a pull in the line of the humerus by lever action.

In fractures above the insertion of the pectoralis major the effect of this type of traction pull is to place the tendon of the long head of the biceps under tension and the head is swung into place.

In supracondylar fractures and fractures of the lower shaft full pronation of the forearm is necessary inasmuch as the elbow is fixed in pronation. Attempts at supination result in a varus deformity.

In fractures of the shaft this type of cast maintains reduction through the splinting action.

Circumduction exercises for the shoulder are permitted and will hasten convalescence. The proper sling length is important to avoid bowing of the fragments. LOUIS SCHEMAN M D

ORTHOPEDICS IN GENERAL

Cornell N W Bernheim A R and Person E C
The Use of Hydrochloric Acid in Certain Cases of Atrophy and Delayed Calcification in Fractured Bones *J Bone & Joint Surg* 1939 21 40

Clinical and roentgenographic observations in 5 cases of fracture with excessive bone atrophy and delayed calcification at the site of the fracture are reported.

The author believes that the bone atrophy in these cases is the result of a metabolic or constitutional disturbance which affects the intestinal absorption and subsequent utilization of calcium salts and therefore is responsible for the delayed union. The disturbance in absorption and utilization of calcium is due to a decrease or absence of hydrochloric acid in the stomach. Oral administration of hydrochloric acid and a diet high in calcium and vitamins increases the absorption of calcium and furthers the calcification of bone.

The blood calcium content is seldom an indication of calcium behavior. The constancy of the blood calcium is maintained largely through the store of calcium in the bones. The calcium absorbed from the bones is not redeposited in bone. The calcium absorbed from the intestinal tract is deposited in the bones. A generous intake of calcium is therefore indicated in cases in which there is special need for deposition of calcium in the bones. In the presence of achlorhydria or hypochlorhydria an increase in calcium and Vitamin D intake is insufficient for proper utilization of calcium and in these cases the addition of hydrochloric acid is indicated. The use of hydrochloric acid without a sufficient calcium intake may be harmful because hydrochloric acid increases the excretion of calcium.

There was no evidence of other disturbances associated with the deposition of calcium salts in the bones in the cases reported. The general condition of the patients and the local conditions at the sites of the fractures were satisfactory for union.

The following should be given daily to stimulate the deposition of calcium:

1. A high calcium and high vitamin diet
2. Vitamin D (1900 units U S P VI)
3. Lactose (100 gm)
4. Calcium lactose (40 gr) or gluconate (80 gr)
5. Hydrochloric acid (10 per cent solution) from 4 to 8 c cm in fluid three times a day with meals.

No food should be eaten between meals and the meals should be five hours apart.

ROBERT P MONTGOMERY M D

Maselli Campagna V. The Formation of Cartilage in Experimental Plastic Interventions on Joints with Free Autografts of Fascia Lata (La condrogenesi nelle artroplastie che sperimentali con auto innesto libero di fascia lata) *Clin chi* 1938 14 831

The modern concepts of the surgical cure of ankylosis induced the author to study the question from a purely histological point of view and to investigate the behavior of the reticulo endothelial system toward transarticular free autoplasmic grafts. For his experiments he selected the knee joint of 2 groups of 5 rabbits each. In the first group composed of young animal of the same litter he completely excised the articular cartilage of both bones and interposed between the denuded bony heads a flap of fascia lata taken from the thigh of the operated side. The flap was fixed to the bones by means of 4 sutures and the joint was closed. In the second group composed of adult animal he excised not only the articular cartilage but also the capsular apparatus and interposed between the bones a flap of fascia lata. The joint was closed and immobilized with a plaster of Paris bandage. The animals of both groups were killed at intervals of fifteen, twenty, thirty, forty and fifty days after the intervention and ten or fifteen days before being sacrificed they were given an injection of from 10 to 15

ccm of a 1 per cent solution of trypan blue in the marginal vein of the ear and in the subcutaneous tissues. The treated joint was removed with its capsular apparatus, fixed, decalcified, and stained for histological examination.

The first group revealed clearly the genesis of the cartilaginous metaplastic process in experimental resection of the articular heads. Undoubtedly, circulatory disturbances play an important part in osteogenesis and chondrogenesis, but the present experiments show that the graft of fascia lata finds a favorable site for its attachment and transformation into cartilage in the continued presence of synovial fluid and the peculiar nutrition by osmosis. The graft receives the full benefit of this nutrition, which allows it to undergo cartilaginous transformation. The reticulo-endothelial elements invading the resection take an active part in this slow but continuous transformation and many elements evolving toward the cartilaginous series demonstrate the accretionary genesis of many of these fixed cells which participate in the process of cartilaginous reconstruction of the new joint.

In the second group the histological picture presented only some variations in detail from that of the first group. In the preparation of animals killed fifteen and twenty days after the intervention, the

periarticular sleeve, consisting of young connective tissue, showed a tendency toward perfect reconstruction of the articular capsule, and the reaction of the reticulo-endothelial system was early and intense, while in the animals prepared thirty and forty days after the intervention there was a veritable process of cartilaginous metaplasia of the newly formed connective tissue. There were numerous chondroblastic elements containing vitally stained granules and showing the accretionary origin of a large part of the cartilaginous cells. In animals prepared after fifty days the cartilaginous investment of the articular heads was practically complete and the articular capsule consisted of fibrous connective tissue showing distinct vital staining. The author concludes that arthroplasty with a free flap of living tissue in the treatment of ankylosis presents the advantage of facilitating the formation of the new joint by attachment of the flap, and of stimulating the reaction of the reticulo-endothelial system, the histocytic elements of which participate greatly in the differentiation of the various layers and tissues of the joint. Therefore, there is decided participation by the elements of accretionary origin in the repair of such cases as well as in cases which present fracture.

RICHARD KEMEL, M D

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Clinical and roentgenographic observations in 5 cases of fracture with excessive bone atrophy and delayed calcification at the site of the fracture are reported.

The author believes that the bone atrophy in these cases is the result of a metabolic or constitutional disturbance which affects the intestinal absorption and subsequent utilization of calcium salts and therefore is responsible for the delayed union. The disturbance in absorption and utilization of calcium is due to a decrease or absence of hydrochloric acid in the stomach. Oral administration of hydrochloric acid and a diet high in calcium and vitamins increases the absorption of calcium and furthers the calcification of bone.

The blood calcium content is seldom an indication of calcium behavior. The constancy of the blood calcium is maintained largely through the store of calcium in the bones. The calcium absorbed from the bones is not redeposited in bone. The calcium absorbed from the intestinal tract is deposited in the bones. A generous intake of calcium is therefore indicated in cases in which there is special need for deposition of calcium in the bones. In the presence of achlorhydria or hypochlorhydria an increase in calcium and Vitamin D intake is insufficient for proper utilization of calcium and in these cases the addition of hydrochloric acid is indicated. The use of hydrochloric acid without a sufficient calcium intake may be harmful because hydrochloric acid increases the excretion of calcium.

There was no evidence of other disturbances associated with the deposition of calcium salts in the bones in the cases reported. The general condition of the patients and the local conditions at the sites of the fractures were satisfactory for union.

The following should be given daily to stimulate the deposition of calcium:

1. A high calcium and high vitamin diet
2. Vitamin D (1900 units U. S. P. VI)
3. Lactose (100 gm.)
4. Calcium lactose (40 gr.) or gluconate (80 gr.)
5. Hydrochloric acid (10 per cent solution) from 4 to 8 c.c. in fluid three times a day with meals.

No food should be eaten between meals and the meals should be five hours apart.

ROBERT P. MONTGOMERY, M.D.

Maselli Campagna V. **The Formation of Cartilage in Experimental Plastic Interventions on Joints with Free Autografts of Fascia Lata.** (*La condrogenesi nelle artroplastiche perimentali con auto innesto libero di fascia lata*) *Clin. chir.* 1938 14 831

The modern concepts of the surgical cure of ankylosis is induced the author to study the question from a purely histological point of view and to investigate the behavior of the reticulo endothelial system toward transarticular free autoplasmic grafts. For his experiments he selected the knee joint of 2 groups of 5 rabbits each. In the first group composed of young animals of the same litter he completely excised the articular cartilage of both bones and interposed between the denuded bony heads a flap of fascia lata taken from the thigh of the operated side. The flap was fixed to the bone by means of 4 sutures and the joint was closed. In the second group composed of adult animals he excised not only the articular cartilage but also the capsular apparatus and interposed between the bones a flap of fascia lata. The joint was closed and immobilized with a plaster of Paris bandage. The animals of both groups were killed at intervals of fifteen, twenty, thirty, forty and fifty days after the intervention and ten or fifteen days before being sacrificed they were given an injection of from 10 to 15

88 (33.6 per cent) underwent amputation and of the 686 Gentile patients, 313 (45.6 per cent) underwent amputation. Thus, 401 of the 948 patients underwent amputation either at the clinic or elsewhere. Eighty-five patients underwent bilateral amputation of the legs, 16 were Jews, the others, Gentiles.

A study of amputations for periods of three, five, and ten years after the onset of the disease indicates that approximately 70 per cent of the patients will go without the necessity of amputation for a period of three years from the onset of the condition, whereas only 60 per cent will go for a period of five years, and only 40 per cent for a period of ten years.

Perhaps the most important factors which determine whether a person who has thrombo-angitis obliterans will continue to walk on two feet throughout life are early diagnosis and thorough education of the patient concerning the nature of his disease and the care of his extremities.

BLOOD, TRANSFUSION

Town, J. F., Nieuwenhuis, G., and Nauta, J. H. Two Cases of Leucemia with Tumor Formation. *Acta med. Scand.*, 1938, 97, 376.

The authors present in detail 2 cases of leucemia with tumor formation. They note that among clinicians as well as among pathologists the problem of the nature of leucemia remains a moot question. Many investigators wish to make a rigorous distinction between leucemia and neoplasms, others point out the close connection existing between these affections.

The authors discuss in detail the history of the 2 patients in whom a connection between the leucemia and blastoma was strongly suggested. On the grounds of data from the literature, from anatomical experimentation, as well as from the pathological examinations reported herewith, they arrive at the conclusion that there is much evidence in favor of the classification of leucemia as a neoplastic disease.

Naegeli and Kaufmann considered leucemia as a hyperplasia of the leucocyte-forming system, that is, an increase in the number of cells without abnormalities in structure, metabolism, or function. Apitz concluded that the cells in leucemia do not fulfill the conditions of hyperplasia and pointed out the similarities between leucemia and neoplastic cells. These similarities may be given briefly as follows:

1. In neoplasia as well as in leucemia, the cells are atypical and the mitosis is anomalous.

2. Normal myeloid cells mature *in vitro*, unlike leucemia cells.

3. In hyperplasia the structure of the tissues affected remains intact, whereas it is destroyed in leucemia and neoplasia. The same picture may be found in the lymph glands in lymphatic leucemia and in lymphosarcoma. Chloroma, which according to Naegeli is a type of leucemia, may cause erosion of the skeleton, in this condition it is difficult to adhere to the theory of hyperplasia.

4. In leucemia, there is an independent formation of leucocytes, the cause of which is unknown. The same is true in neoplasia.

The authors note that certain investigators succeeded in producing a typical lymphatic leucemia in healthy guinea pigs by inoculation with a few live leucemia cells. Injury of the cells, or inoculation with filtrations of blood or lymph-gland emulsions always gave negative results. Many investigators independently produced leucemia in mice by means of subcutaneous benzol injections. When the injections were discontinued, the leucemia process went on undisturbed. This phenomenon is the reverse of what is seen in hyperplasia, in which the cells cease to increase when the exogenous stimulant is removed.

HERBERT F. THURSTON, M.D.

Howkins, J., and Brewer, H. F. Placental Blood for Transfusion. *Lancet*, 1939, 236, 132.

The authors found that the average yield of blood from the placenta in 50 consecutive cases was 47 c.c. as against 125 c.c. reported by Goodall and 105 c.c. obtained by Grodberg. Their technique of collection and preservation was similar to that reported by Goodall. Aerobic and anaerobic cultures revealed that 22 per cent of the collections were contaminated by the bacillus subtilis, bacillus coli, staphylococcus albus, and bacillus pyocyaneus. Repeat cultures after two weeks in cold storage yielded results identical to those of the primary cultures. The authors believe that these findings contradict the belief of Goodall that the low temperature prevents growth or even kills the organisms.

It was concluded that, as the quantities obtained were so small and thus necessitated so much handling, the placenta was not a practical source of blood for transfusion. The positive cultures which were still positive after a period of two weeks in cold storage were believed to contraindicate the use of this means of preservation.

THOMAS C. DOUGLASS, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Wagner W. Observations and Treatment in So Called Thrombosis of the Axillary Veins (Beobachtungen und Behandlung bei der sogenannten Achselvenenthrombose) *Zeitschrift f. Chir.* 1938 p 2169

True thrombosis of the axillary or subclavian vein occurs but rarely in the so called traumatic thrombosis of the axillary vein. Usually there is only a venous stasis as a result of mechanical obstruction to the venous outflow. On the basis of the well known observation of traumatic segmentary arterial spasm and the contractility of the veins the author comes to the conclusion that traction or tension of the axillary veins can produce a segmentary venous spasm and with it the corresponding states of stasis. At the same time it should be borne in mind that the axillary veins in their passage under the clavicle are firmly ensheathed by the coracoclavicular fascia and thereby more or less firmly fixed to the clavicle. A second such point of fixation is the passage of the subclavian vein over the first rib. At these points functional spasm of the veins can occur at first with certain movements such as of the arm. The result is first venous stasis and with prolonged existence of the same overdistention of the vein, edema and induration of the surrounding fatty tissue. Pathological strands of fascia, the axillary arch of Langer or packets of glands and tumors of callus which are usually considered the cause of the venous stasis are considered only as additional factors possibly favoring venous stasis.

The treatment required therefore is first of all the earliest possible and most rapid elimination of the primary vascular spasm in order to hinder the development of the secondary changes such as overdistention of the veins. The treatment recommended includes the intravenous injection of anti spasmotic remedies like eupaverin, repeated venesections, the application of leeches and short wave therapy. If secondary changes in the vein or its walls have already developed only the surgical removal of the obstructions disturbing the outflow of blood can help. These observations are based upon 4 cases and 1 observation made by the author (VON BRANDIS) LOUIS NEUWELT M.D.

Paschoud H. Some New Methods in the Prophylaxis of Postoperative Thrombophlebitis (Réflexions sur quelques nouvelles méthodes dans la prophylaxie de la thrombophlébite postopératoire) *J. internat. de chir.* 1938 3 671

Paschoud notes that the fact that thrombotic embolism may develop in an adolescent in good health after an operation for hernia not complicated by infection or fever tends to disprove some of the theories in regard to the causation of postoperative

thrombophlebitis. In such a case there is neither a lesion in the vascular wall nor infection which conditions have been considered causative factors in thrombophlebitis. The author's study of postoperative thrombophlebitis and of the most effective prophylactic measure has convinced him that the two factors necessary for the production of thrombophlebitis are a slowing up of the circulation and changes in the composition of the blood.

On this basis he has found that the most effective measures to prevent postoperative thrombophlebitis are the production of local hyperemia by the use of infra red and sometimes ultraviolet irradiation before and during operation and the rising of the patient several times a day immediately after operation. In cases in which some cardiac or other serious complication prevents this degree of activity the patient is moved in bed frequently. Other important factors in the prevention of postoperative thrombophlebitis are the pre-operative preparation, the use of the newer anesthetics, the inhalation of carbon dioxide at the close of the operation and the postoperative treatment. Important in the pre-operative and postoperative treatment are the administration of saline and glucose by the drop method, either per rectum or intravenously, an alkaline vegetable diet and a rich supply of vitamins, especially Vitamin C (redoxon given by injection when necessary).

In the five years in which these methods have been employed in the author's clinic at Lausanne there have been but 2 deaths due to postoperative thrombosis and embolism, both occurring in 1938. During the period from 1934 to 1937 there was no fatal case of postoperative embolism and the general surgical mortality has been reduced from 4.69 to 1.71 per cent. LUCIE M. MEYERS

Horton B. T. The Outlook in Thrombo Angiitis Obliterans *J. Clin. Med.* 1938 111 2184

A total of 948 patients who had thromboangiitis obliterans were observed at the Mayo Clinic from 1907 to 1937 inclusive. These patients came from every state in the Union except 3 and from 10 foreign countries. More than 28 different nationalities were represented. Two hundred and sixty two (28 per cent) of the patients were Jews. 686 were Gentiles. The same fundamental pathological process was present in all cases and the signs and symptoms as well as the clinical course of the disease were strikingly similar. Twenty one of the patients were women and the remaining 927 men. In other words approximately 98 per cent of the patients were men. The mean age of the males was forty one and eight tenths years of the female thirty eight and eight tenths years.

Of the 948 patients in the series 880 (93 per cent) were cigarette smokers. Of the 262 Jewish patients

tients as evaluated by the clinical examination. The pre-operative prognosis as to postoperative complications corresponded to the 4 classes of vital resistance established by Zambini, which for prognostic purposes can be termed excellent, good, reserved, and unfavorable. Infected surgical cases with closed suppuration form an exception to this rule because they take a particular course. In aseptic cases in which the postoperative course is normal, the post-operative curve of the salivary reaction is characteristic after an initial fall on the first day, it rises gradually to reach its original height about the tenth day. The curves show that morphine has an immediate depressing action on the vital resistance. If a curve presents marked oscillations with low points which last several days, a local or general complication that is arising or has already arisen must be suspected. In cases of simple inflammatory reaction or of suppuration, a fall in the curve always precedes the appearance of clinically demonstrable signs by one or two days, and the curve returns promptly to normal when the pus is evacuated. The turbidity, sedimentation, and halo generally run a course parallel to the chromometric values.

RICHARD KEMEL, M D

Schoen, R. *Pharmacology and Special Therapy of Circulatory Collapse* (Pharmakologie und spezielle Therapie des Kreislaufkollapses). *Verhandl. d. deutsch. Gesellsch. f. Kreislaufforsch.*, 1938, p. 80.

The experiences of the late war have led to concentrated efforts directed against circulatory collapse. Camphor and adrenalin in new forms are today still the principal means used to bring back into active circulation the blood stagnating in the great venous reservoirs, however, the search for other preparations, experimentation, and clinical observations are by no means at an end. The desired elevation of the blood pressure is an expression of the transference of the blood to the arterial side and presupposes an increase in the cardiac efficiency and the re-establishment of the vasomotor tonus. The ideal preparation for conditions of collapse is that which transfers the blood from the venous side back into its normal channels, without regard to whether it produces any marked increase in the blood pressure or not. The author discusses clinical experiences and animal experimentation (including that done on decapitated animals), the results of which are far from clear when applied to the normal human heart and vascular system, and especially when applied to the diseased human heart. In trying out the various new preparations we still lack an appropriate basis of comparison, because of the dosages employed and because of indirect pharmacological effects.

Preparations to combat collapse are divided, according to their principal point of attack into the cerebral-analeptic and the peripheral acting types. The former are spasm-exciting, they produce paralysis in large doses and affect the central nervous system, the latter have a direct tonic effect

upon the peripheral vessels. Adrenalin, ephedrine, and veritol produce their effects by way of the various attachments of OH-groups to the benzol nucleus with a side chain of 2 C with an amino terminal group. All these preparations stimulate the sympathetic system. The effects of adrenalin are transitory, a practical method of prolonging its action is by means of the continuous drip-infusion and the addition of very small amounts of adrenalin, from 0.1 to 0.3 mgm. The action of sympatol is similar, only 100 times weaker. The best of all so far has been veritol, particularly because of its therapeutic applicability and favorable influence on the heart, especially in cases of postoperative collapse. It is given intramuscularly in doses of from 10 to 20 mgm. The author appends 4 charts showing the systolic and diastolic blood pressure and the pulse rate in man, with supran, subcutaneously, with veritol, intravenously, and with pervitin, subcutaneously and per os. So far this group of adrenalin-like, sympathetic-stimulating preparations has exhibited a perplexing diversity of action with reference to duration and intensity of action, dependability upon oral administration, ratios of intensities of vascular and cardiac effects, preponderance of effects on the veins or on the arteries, and the danger of secondary effects, especially on the heart. Intravenous administration is best avoided. So far the best resuscitating preparation acting by way of the brain has been camphor in the form of cardiazol. This is true because of its effects on the circulation and respiration, however, the action is brief, of somewhat longer duration is the effect produced by coramin. There is nothing essentially new in neospiran and in cykloton, caffeine also has powerful peripheral effects. Practically there is justification for regarding acute impending collapse as a separate entity, for treatment cardiazol given intravenously has its place, but in cases in which there is poisoning from carbon monoxide or from veronal, caution is demanded because of the latent tendency toward spasm. If the cardiazol is not effective within a short time, other preparations which act on the peripheral circulation, such as veritol (subcutaneously), should be tried. Especially advantageous is the simultaneous, or alternate administration of doses of centrally and peripherally acting preparations. Preparations in which both centrally and peripherally acting drugs are already in mixture, such as tioral, are to be avoided. The special treatment of the individual collapse condition is based upon the results of experimental researches and clinical experience. Cerebral analeptics are recommended in cases of collapse during narcosis, with toxic conditions of the central nervous system, with loss of adaptive response of the vasomotor apparatus during convalescence, of hypotonic states, of orthostatic collapse, of fainting, of hypoglycemic shock, and of collapse from lack of oxygen under diminished atmospheric pressure (sickness from high altitudes), in which coramin given intravenously is especially valuable. In infectious cases excellent

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Lassen H. K. I The Prognostic Significance of Pre Operative Investigation of the Vital Capacity II The Influence of Various Operations and of Postoperative Complications on Vital Capacity *Acta chirurg Scand* 1938 81 343 361

The vital capacity is the amount of air that a patient can expel after a full inspiration. This capacity was estimated in a total of 464 surgical patients. Three hundred and fifty nine were operated upon and 33 died. One hundred and ninety nine of the 359 who were operated upon had a lowered vital capacity. In 230 an electrocardiographic study and an x ray examination of the heart were made in addition to the estimation of the vital capacity. Apparently postoperative pneumonia occurred just as frequently whether or not the vital capacity was lowered. On the other hand a lowered vital capacity seems to indicate a rather greater chance of the occurrence of phlebitis, infarct or embolism. Examination indicated that normal conditions were present in 69 of the patients operated upon. Only 1 died as a result of circulatory insufficiency. The autopsy however revealed the heart to be normal.

The vital capacity was normal in 160 of the patients who were operated upon. Of these only 2 died of circulatory insufficiency. Of the 230 patients who were operated upon and who had been examined by all the methods 10 died of circulatory insufficiency. The author was able to predict at the most only 1 of these deaths from an ordinary examination of the heart, only 5 deaths by means of electrocardiography, only 7 by means of x ray examination of the heart, and only 8 by means of estimation of the vital capacity. The mortality occurring as a result of circulatory insufficiency in the cases of patients with lowered vital capacity alone was found to be 5.2 times greater than in those with normal vital capacity. The mortality from circulatory insufficiency is 4.6 times greater when only one of the tests in question shows a pathological condition than when all the tests show normal conditions. When all the tests show pathological conditions the mortality resulting from circulatory insufficiency is about 12 times greater than when conditions are normal. Each laparotomy lowers the vital capacity and the higher the incision in the abdomen the more the capacity is lowered. On the contrary the vital capacity is not influenced by operations on the extremities, nor is it influenced to any great extent by various kinds of narcosis and anesthesia in complicated cases.

Complications such as bronchitis, pneumonia and infarct further lower the vital capacity according to the degree of complication. These complications also draw out considerably the period that elapses

before the vital capacity again becomes normal. In some cases the injection of morphine has no influence on the amount of the vital capacity estimated; in other cases a slight increase results. It must therefore be concluded that pain in the wound itself does not play so great a part in the lowering of the postoperative vital capacity as does the reflex muscular spasm. MANUEL E. LICHTENSTEIN, M.D.

Rendano C. Zambrini's Salivary Reaction and Its Applications in Surgery (*La ptalo-reazione dello Zambrini e le sue applicazioni in chirurgia*). *Riv di chir* 1938 4 537

The basis of Zambrini's salivary reaction rests on the peculiar character communicated to the humoral fluid by the constitution on the influence exerted on these fluids by pathological conditions and in general by the changes in humoral equilibrium of the organism. The reagent used consists of cochineal red 1 gm, trioxanthraquinone 1 gm, dioxyanthraquinone 7 gm, rubia tincture 130 gm, and 95 per cent alcohol 1000 gm. For the reaction 1 c cm of total saliva is mixed with 33 c cm of the reagent; the mixture is well shaken and its color serves to show the degree of vital resistance of the organism. The color varies from very light yellow to dark violet passing through various shades of red; the lightest colors correspond to the lowest degrees of the scale established by Zambrini and to the lowest clinical values. Even in the lightest colors a violet smokiness indicates a tendency toward improvement. In healthy subjects the mixture is limpid; turbidity indicates pre-existing disease or during puberty a change in the constitution. Sediment is due to disintegration of vital substances caused by the disease and is proportionate to the gravity of the morbid condition. A golden yellow halo seen by tangential light at the superficies of the mixture is found in all cases of infectious disease capable of producing toxins and its intensity is proportionate to the decrease in the defensive powers of the organism.

On the basis of a study of 200,000 cases Zambrini has established 4 classes of vital resistance: (1) values between 16 and 13 of his chromometric scale—excellent; (2) values between 12 and 9—satisfactory; (3) values between 8 and 5—bad; and (4) values between 4 and 1—very bad. Various authors have used the reaction in different fields and have reported satisfactory results.

Rendano has performed the reaction in 100 surgical cases for three or four days before the intervention, taking readings thirty minutes and again twenty-four hours after making the mixture and establishing an average for the readings in order to formulate an operative prognosis. He found marked agreement between the pre-operative data given by the reaction and the general condition of the pa-

taining bleaching powder, and the surgeon himself protected during the procedure. He also recommends the use of analgesics in the treatment of burns and injuries of the eyes.

WILLIAM C. BECK, M.D.

Dénier, A. Electrical Anesthesia (L'électro-narcose) *Anes et anal*, 1938, 4 451

Dénier reviews the history of experiments in obtaining anesthesia with interrupted electrical currents of low tension. In common with other investigators, whose work he discusses, he has found it impossible to produce anesthesia without producing contractures and convulsive movements with interrupted currents. In experiments on rabbits with interrupted high-frequency currents, it was found possible to obtain anesthesia without contractures or convulsive movements by varying the tension, the frequency, and the space of interruption, a frequency of from 85,000 to 120,000 per second with a tension of from 20 to 45 ma. and interruption of from 15 to 135 sigmas was found to be most favorable.

Some experiments have been conducted on man, but not with a view to producing surgical anesthesia. The author is not certain that this method is applicable in this field. In some psychopathic patients, he has found that the application of the interrupted high-frequency currents of low tension with frontal and occipital electrodes has had a favorable effect on the electro-encephalogram and has induced a state of euphoria clinically. These currents also have a vasodilating effect, and the author has observed cases of ischemia, arteritis, and gangrene successfully treated with this type of current at Lenin-grad.

He has himself treated 2 cases of obliterating arteritis of the lower extremities by this method with good results, especially in consideration of the fact that other methods of treatment previously used (including sympathectomy) had failed to produce any improvement.

ALICE M. MEYERS

Kelman, H., and Abbott, G. A. Toxic Myelopathy (Spinocaine) *Ann Surg*, 1938, 108 1001

The authors state that severe myocardial disease, hypertension, marked hypotension, and psychoneuroses have been considered contraindications to spinal anesthesia, and on the basis of 5 untoward reactions following spinal anesthesia they believe there are other contraindications.

Following the injection of an anesthetic medium into the subarachnoid space a reversible reaction occurs in the nerve cells. There are certain traits which may interfere with the normal reversibility of this reaction. These traits, they believe, are the

congenital anomalies in general, particularly those of the central nervous system, as well as diseases of that system, congenital anomalies and diseases of the circulatory system, such as a tendency toward, or the presence of, varicosities, endarteritis, or phlebitis, and congenital anomalies and diseases of the skin and epidermal appendages, such as pilonidal cyst, with which spina bifida occulta is often associated.

The importance of severe neurotic traits as a contraindication to the employment of spinal anesthesia was emphasized. All of the patients had a cauda-equina neuropathy or lumboneuropathy following the anesthesia. In most of the cases it remained for a considerable time, and in some it has remained permanently.

WILLIAM C. BECK, M.D.

Cordier, D. The Problem of Anesthesia in the Wounded Who Are Gassed (Le problème de l'anesthésie chez les blessés gazés) *Anes et anal*, 1938, 4 429

In recent years the question of anesthesia for wounded persons who are gassed has been a subject of discussion at congresses and conferences. Yet, Cordier notes, there are very few experimental studies that might guide the surgeon in such conditions. The various war gases employed act upon the mucosa of the respiratory tract, including the lungs, as well as upon other tissues. They have a destructive action on protoplasm, and may cause congestion, edema, or suppuration in the lungs and in the upper respiratory tract.

From a review of the literature on the subject Cordier concludes that local or regional anesthesia should be used whenever possible. The question of the preliminary use of sedatives in gassed patients deserves further study, there is considerable difference of opinion as to the dangers of such drugs as morphine and scopolamine in these cases. Spinal anesthesia should be reserved for gassed patients without hypotension when the lower extremities are operated upon. When local or regional anesthesia cannot be used, fluid anesthetics given by intravenous injection or by rectal instillation should be given preference over inhalation anesthesia. It is difficult to determine whether evipan or avertin should be given the preference for this type of anesthesia, German authors incline to favor the former, because of the simple technique for its administration. Further experiments are necessary to determine under what circumstances inhalation anesthesia may be employed in persons who have been gassed, all authorities are in accord in stating that volatile anesthetics should not be employed in these cases.

ALICE M. MEYERS

results may be procured both by the centrally and the peripherally acting substances given either together or alternately. In the absence of cerebral involvement the peripherally acting preparations because of their generally more persistent effects are to be preferred. Appropriate as a prophylactic agent against collapse in infectious cases is ephedrine given per os. In instances of postoperative collapse including those following spinal anesthesia as well as all severe conditions with damage to the peripheral vascular system the treatment is the administration of a peripherally acting preparation by injection and when there has been loss of blood by infusion. In these cases sympatol and veritol should receive first consideration. In the treatment of the milder instances and for prophylaxis administration per os should be considered. Central excitants should not be employed in fresh instances of poisoning by war gas.

An extensive bibliography is appended. From the discussion in which 11 workers took part and according to the author himself it is evident that in such a short review not more than a few guiding principles could be touched upon also that as regard the effect of veritol on the human being opinions still differ greatly. (EGGERT) JOHN W. BRENNAN M.D.

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Sheplar A. E. Spence M. J. and MacNeal W. J. *Serum Therapy for Infections with Streptococci*. General Observations. *Arch Surg* 1938 37 172.

The authors continue their observations on the serum therapy of hemolytic and non hemolytic streptococci. Four earlier articles have dealt with the general technique of treatment and have presented the records of 6 patients. The present report is based on the case of 66 additional patients. Eighteen of these died and 48 recovered the mortality amounting to 27.3 per cent. Most of the patients had been referred to the authors and treatment was begun when they were already desperately ill. No attempt was made to select cases those with evident meningitis and peritonitis were included with those which were less severe. The age of the patients varied from nineteen days to eighty years. The sera used were the concentrated streptococcus serum of the New York State Department of Health, the unconcentrated streptococcus serum of the New York State Department of Health and the concentrated streptococcus serum biological 2005 of Parke Davis & Company. No single preference is expressed. Of the total amounts given 804,400 units of the New York State serum and 340 c.m. of the Parke Davis & Company serum were maximal although much smaller totals were customary. Test doses of 0.1 c.m. of 1:10 dilution were first given intracutaneously if no reaction occurred increasing amounts of the same dilution were given subcutaneously then intramuscularly. Increasingly

potent doses were given intramuscularly and finally the undiluted serum was given intravenously.

If shortly after the administration of serum the patient experienced chills a sudden rise in temperature diaphoresis and then a fall in temperature the authors regarded the reaction as favorable. Such a response so often observed in the treatment of sepsis when an adequate amount of antibacterial agent (be it a chemical bacteriophage or serum) has been introduced into the blood stream is designated by the authors as the Hugh Young reaction since it was he who described it in association with the intravenous administration of mercurochrome in septic patients. They believe that such a visible reaction is the external manifestation which indicates a turning of the balance in the fight between the bacteria and the protective forces of the body and that it is probably due to an injury inflicted on the invading bacteria by the therapeutic agent. Conditions successfully treated include cellulitis of various regions, otitis media, mastoiditis, pneumonia and a case of mediastinitis. Surgical drainage was employed when indicated. Many of the patients were also treated with sulfanilamide, bacteriophage and multiple transfusions. A combination of serum therapy with these agents seems promising. A. F. JONES JR. M.D.

ANESTHESIA

Balme H. *The Treatment of Pain in Severe Injuries*. *Practitioner* 1938 141 757.

The author urges that treatment be given for pain in severe injury. He prefaces his article with some remarks upon the unpreparedness of the practitioner of medicine for the severe accidents which occur during warfare and call attention to the extreme importance of the care of pain in war injuries. Traumatic pain may be divided into three parts: the initial pain resulting from the accident itself, the pain produced and aggravated by movement, friction or exposure during the first aid treatment or transport and the reactionary pain which occurs after some hours or days because of inflammatory processes or local pressure.

In his opinion the pain caused by the original injury should be treated with morphine or dilaudid. During transport it is extremely important that the injured part is kept at rest. He emphasizes that traction alone is not sufficient to keep the part at rest but that support is often required. The suturing of wounds should always be carried out under an anesthetic even if only a local anesthetic is used. The third type of pain which is due to inflammation or the tension of constricting bandages should be treated by the evacuation of hematomas or pus.

In the treatment of burns in infants and children he believes that the tincture of opium is most valuable while in the adult morphine should be used. In the treatment of burns due to muirard gas, lavage of the burned area as well as of areas not burned should be carried out with water con-

the mutations These are markedly increased by irradiation of the genital glands The production of mutations stands in direct relationship to ionization, i.e., to the number of roentgen units which reach the genital glands, since the number of roentgen units is a measure of the amount of ionization So far mutations have not been produced by irradiation with the longer wave-lengths There is no threshold-dose for the induction of mutations by roentgen and radium rays, either in relation to the length of the wave, or to the dosage employed, consequently even the very smallest dosage of any sort of short-wave, ionizing ray may induce mutation Mutation is independent of the chronological distribution of the total dosage, and consequently it does not matter whether the genital gland is subjected to high intensities for a brief interval, or to lower intensities throughout a longer period of time, i.e., whether the irradiation is carried out by the protracted or by the fractionated method The single irradiation insults have a summing effect in the matter of starting mutation processes, and this, not only in the individual throughout life, but for a term of generations if the individual does not die without issue Herein lies the problem of irradiation with regard to race-hygiene The mutations of irradiation are irreversible, and herein the changes produced by the roentgen rays in the heredity-carrying component differ essentially from the changes produced in the other body-tissues, since both induced and spontaneous mutations signify a transition from one stable condition of the gene to another stable condition Consequently a study of the blood-picture is no criterion as to the possibility of mutation having been induced in the genital glands

On the basis of the studies of Timoféeff, somatic induction, i.e., indirect injury to the reproductive glands from irradiation of the neighboring regions of the body is to be denied, nor do mutations occur when only the germ plasma, not the nucleus of the cell which is the bearer of the inheritance-carrying substance, is the part affected This is of practical importance in view of the fact that minimal dosages of roentgen rays may so injure the follicular apparatus and the plasma of the ovum that the rut, or heat-cycle in the animal may exhibit abnormalities A small dosage of irradiation preceding a large dose does not result in a higher mutation rate than when both irradiation dosages are given simultaneously, the sum of the irradiation-ionization effects to which the heredity-bearing substance has been subjected in the course of time is always the determining factor

All the results of the study of the genetic effects of irradiation on plants and animals are not as yet of practical evaluation with regard to the human being as the injury induced by the roentgen rays is recognizable only after several generations For this reason direct proof of an injurious effect of the short-waves is not yet at hand since our period of observation, compared with the duration of a generation in

the human being, is too brief Consequently if a normal child is borne by an irradiated mother, it should not be concluded that danger of injury to the heredity-factor is not present

Experimental studies by the authors (*Deutsche med Wchnschr*, 1936) have shown that the diminished percentages of successful matings in guinea pigs, following irradiation with extremely small dosages, were obtained not only in the parent animals but in the daughter animal of the irradiated mother (F_1 generation) as well In these cases the dosages were from 5 to 50 roentgen units, which extend to well within the range of the dosages incident to roentgen diagnosis However, changes in the genes were not involved in this study but rather injury to the germ plasma In reference to the tolerance dosage of 3 roentgen units as given by Pickhan, it is pointed out that this dosage was determined for the human being merely by analogy from results obtained on the drosophila, furthermore, there is no irradiation dosage which may be regarded as unharmed to the heredity-bearing substance, and the individual dosages of less than 3 roentgen units are in their effects fully summative

The roentgen dosages which in practice reach the deeper regions of the pelvis in diagnostic fluoroscopy are given, and it can be seen that the series fluoroscopic examinations employed in the diagnosis of intestinal conditions meet the tolerance dose of 3 roentgen units For this reason the greatest caution is required in all cases in which irradiation is given in the immediate vicinity of the reproductive glands The total exposure should be limited to show only what is absolutely necessary It must also be considered that "soma" mutations, particularly cancer mutations, may be induced by short-wave irradiation This fact was demonstrated by experiments on mouse-tumor strains in which the whole body was irradiated Therefore, the roentgen-ray is not only a medium in the fight against cancer, it is also a medium for the induction of cancer The effects of secondary rays, either in diagnostic or in therapeutic amounts, upon the gland which does not lie directly in the path of the primary rays, do not equal those of 3 roentgen units and are therefore not of practical importance

The authors conclude that, in roentgen and radium therapy in gynecology, the ovary of the woman should be protected from every type of irradiation while there is still the chance of offspring, especially since the therapeutic effect sought, the weak dosages for ovarian insufficiency, or the irradiation treatment of inflammatory processes, in most instances, is attainable with therapeutic measures which have no bearing on race-hygiene As for the rest, results from irradiation are not in general so striking that we can afford to risk in their behalf an increase in the total number of mutations in the general population However, in many cases roentgen diagnosis is indispensable, and the question of injury to the heredity-bearing substance by roentgen and radium rays in amounts indispensable in practice is, in the

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Kawaishi K. Studies on Roentgen Cinematography of the Internal Organs and of the Circulation of the Blood in the Human Body. *Am J Roentgenol* 1938 40 913

With the aid of a specially constructed unit which he describes the author conducted many experiments to determine the optimum conditions for roentgen cinematography by the indirect method of filming the image appearing on the fluoroscopic screen. He endeavored to ascertain (1) the optimum intensity and dosage (2) the wave of light which has the highest intensity as revealed by spectra of fluorescence of fluorescent and strengthening screens (3) the relation between films and screens (4) the sensitivity of various films (5) the speed of filming and (6) the limitations of dosage to avoid bad after effects. The results of these studies are discussed and some of them are portrayed graphically.

For practical use some of the conclusions reached are as follows:

1. A screen consisting of a mixture of zinc sulphite and cadmium sulphite is best.

2. The optimum intensity and dosage for roentgen cinematography of the stomach, intestine, pelvis and ureter of the human are 125 kv (peak) and 50 ma. For the chest 110 kv (peak) and 50 ma. are sufficient.

3. The maximum speed for cinematography of the human chest is 30 frames a second; the optimum speed for the esophagus is 16 frames; for the stomach, gall bladder and intestines from 4 to 8 frames; for the pelvis and ureter 8 frames; for the blood circulation of the extremities with opaque substance 50 frames a second. ADOLPH HARTUNG, M.D.

Brunschwig A. Observations on the Changes Occurring at Benign Giant Cell Tumor Sites Several Years Following Treatment by Conservative Measures. *Am J Roentgenol* 1938 40 817

In the past fifteen years conservative measures in the form of local resection, curettage and irradiation either alone or in combination with surgical procedures have in general replaced amputation or radical resection in the treatment of giant cell tumors. Thus it has become established that giant cell tumors are essentially benign lesions but it is likewise recognized that they may become the sites of malignant neoplasms which metastasize and kill the patient.

Since conservative management has now been generally practiced for a number of years it is perhaps of interest to consider what may be expected to occur at the sites of these tumors several years following such treatment in cases in which sarcoma of one type or another has not developed.

Such investigation made by the author showed that following roentgen therapy alone a gradual reossification first about the periphery and then extending centrally takes place. Areas of reduced density may persist unossified for years. A new dense cortex does not re-form over the tumor site. Evidence is presented to indicate that such ossification is due principally to metaplasia in the tumor which is an effect of the irradiation. When the lesions are intramedullary new bone formation may also occur as a result of endosteal activity in the adjacent cancellous bone and from the inner surface of the overlying shell.

Following curettage (with or without roentgen therapy) the changes are not those occurring in tumor tissue but in the large blood clot which develops subsequent to operation. This becomes organized by dense fibrous tissue and when the tumor site is large small fluid containing cavities persist throughout the region. At first new bone develops about the periphery of the site and a well defined cortex is re-formed. Permeation of cancellous bone into the organized hematoma is very slow and may take place only to a limited extent. There may be a latent period of several years before considerable central reossification develops although endosteum is always present over the bone adjoining the site. In small giant cell tumors reossification throughout the tumor site usually occurs.

The fact that abnormalities in the bony architecture will persist in the absence of active tumor tissue for years following curettage and roentgen therapy each alone or in combination is of importance in evaluating roentgenograms taken in follow up studies.

JOSEPH K. NAKAT, M.D.

Martius H. and Kroening F. The Question of Inheritance of Injuries from Roentgen and Radium Irradiation. (Zur Frage der Erbgutschaedigung durch Roentgen und Radiumstrahlen). *Med Welt* 1938 p 947

This article was written in response to inquiries from members of the medical profession. The problems here treated are: may the germ cell be injured by exposure to the roentgen ray and what dosage of roentgen rays is to be used for purposes of diagnosis in regions of the human body involving the genital glands without danger of injury to those components of the germ cell which carry the inherited characteristics (artificial mutation)?

Studies on the subject of genetics in reference to irradiation have shown that mutation produced by the roentgen rays follow the same laws and apply to all cells throughout the whole realm of living nature and not merely in the germ cell but also fundamentally in the somatic cells.

The changes in the inherited biological characteristics produced by roentgen and radium rays are

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Price, P. B. *Surgical Bacteriology and Surgical Technique, with Special Reference to Disinfection of the Skin* *J Am M Ass*, 1938, 111, 1993

The bacterial flora of normal skin is found to be composed of "transients" and "residents"

Transients, which are collected from extraneous sources, may be present in enormous numbers at times, but as a rule relatively few are present on grossly clean hands or on clean protected (unexposed) skin

The size of the basic (or resident) flora at any given time is the net result of factors constantly acting, some to increase, others to decrease, the bacterial "population" Increase results largely from multiplication of resident organisms already present Decrease is brought about by washing, friction of clothing, and influences deleterious to bacterial life

The basic flora includes some pathogenic bacteria If hands are in frequent contact with contaminated objects, a dangerously large proportion of the resident bacteria may be pathogens In such cases it is almost impossible to disinfect the hands In this hitherto unsuspected manner a person may become a carrier of virulent organisms The basic flora of protected skin per unit area is no smaller than that of the hands

Scrubbing with brush, soap, and warm water reduces this basic flora at a constant rate Irrespective of the initial size of the flora, the number of bacteria is reduced by approximately one-half with each six minutes of scrubbing The kind of soap used makes no difference Variations in the temperature of the water used has no appreciable influence on the rate The amount of vigor used in brushing is a very important factor, however Sterile water has been found to possess no advantage over ordinary tap water in reducing this flora

Ethyl alcohol has a very narrow range of effective germicidal concentrations The optimum germicidal strength, both *in vitro* and on the skin, is 70 per cent by weight (not by volume as ordinarily prepared) At precisely this concentration, alcohol is more effective than any other hand disinfectant now in general use Each minute spent in this particular solution (at 25° C) has a cleansing effect equivalent to about six and one-half minutes of scrubbing This effect may be increased considerably by friction, i e by rubbing with gauze or a wash cloth

Mercury bichloride solutions do not reduce the flora on the skin appreciably Paradoxically, a sterile cutaneous surface may be produced This phenomenon is due to the formation of a transparent "film" on the skin under which the bacteria are im-

prisoned There, conditions are so suitable to life that multiplication takes place, the existing flora doubling every fifty minutes The "film" may be broken up, either with an alkaline sulfide or by prolonged friction, whereupon the bacteria are released uninjured

The same phenomenon is observed when potassium mercuric iodide (biniodide) or Harrington's solution is used Neither of these is a true germicide when applied to the skin When tested, these agents should always be followed by an alkaline sulfide

Kelly's method of hand disinfection (with hot saturated solutions of potassium permanganate and oxalic acid) is very effective The procedure requires from two and one-half to more than five minutes, depending on the temperature of the solutions The total cleansing effects are equivalent to between twenty and thirty minutes of scrubbing

The lime and soda method is also very effective When rubbing with the paste is continued for four minutes the reduction of flora is as great as could be accomplished by twenty minutes of scrubbing

Saponated solution of cresol, though a relatively strong germicide against test organisms *in vitro*, proved a worthless disinfectant of the skin

A search for a more nearly ideal hand disinfectant has resulted in the production of a new germicidal mixture which seems to possess certain advantages over any of the agents in general use It is powerfully germicidal, each minute spent in it (at 25° C without friction) being equivalent to more than eleven minutes of scrubbing It is simple and pleasant to use It does not irritate or injure the skin It is more stable than simple ethyl alcohol solutions This germicide consists of ethyl alcohol 50 parts by weight, normal propyl alcohol 20 parts by weight, and water 30 parts by weight It may be prepared as follows: ethyl alcohol (95 per cent) 675 c m, pure n-propyl alcohol 250 c m, and distilled water 250 c m, all measurements being made at 25° C

Freshly prepared (U S P) tincture of iodine (7 per cent), applied to grease-free skin and followed by an antiodote, comes nearer to full sterilization of the epidermis than any other germicide tested

From bacteriostatic and bacteriocidal standpoints, mercurochrome is in many respects similar to the inorganic salts of mercury

Pre-operative preparation of the hands The following procedures are recommended

- 1 The hands are scrubbed with soap, a good brush, and warm water for at least seven minutes This will usually suffice to remove gross dirt, transient bacteria and fats, and incidentally about half the basic flora

- 2 The resident flora is much more effectively attacked by germicides than by scrubbing Ethyl alcohol, 70 per cent by weight, or the mixture of alcohol described is recommended These solutions should

opinion of the authors less an individual problem of the immediate future than a problem of race hygiene for the more distant future of the entire population. Therefore the authors strongly advocate that roentgen and radium rays in dosages insufficient to produce definitive sterility should insofar as at all permissible in view of the practical needs of diagnosis and therapy be dispensed with and also that the personnel entrusted with the administration of irradiation treatments should be protected from the danger of irradiation injury by technical protective appliances so that we may not be reproached by future generations for not having exercised sufficient care.

(F. SIEGERT) JOHN W. BRENNAN M.D.

RADIUM

Engelstad R. B. The Treatment of Lymph Node Metastases from Carcinomas of the Lips and of the Oral Cavity. *Acta radiol.* 1938 19 546

In the Norwegian Radium Hospital 135 patients who had carcinoma of the oral cavity were treated from 1932 to 1935. Seventy-two of these had carcinoma of the tongue and 63 had carcinoma of the gingiva, the palate or the lip. Of the total group 32.6 per cent were free from symptoms from two and one-half to six years after treatment. Among the 54 patients who had no glandular metastases 61.1 per cent were free from symptoms from two and one-half to six years only 17.4 per cent of 81 patients

with glandular involvement were free from symptoms. In the treatment of lymph node metastases the best results were obtained from telerradium treatment with block dissection. The radium skin distance used was from 5 to 10 cm. epidermical doses were given which resulted in exudative epidermitis. The total block dissection was done in the method of Roux-Berger.

During the same period 141 patients with carcinoma of the lip were treated and of the total group 65.2 per cent were free from symptoms at the end of from two and one-half to six years. Of the patients without glandular metastases 87.7 per cent were well whereas in the group with metastases 40.2 per cent were free from symptoms.

An analysis of the results of various methods of treatment demonstrates that the glandular metastases from carcinoma of the lip may often respond satisfactorily to telerradium treatment only. If the glands do not disappear after a period of from six to eight weeks following the radium treatment a total block dissection is done. Although it is sometimes possible to destroy metastases with telerradium treatment only in carcinoma of the oral cavity in the majority of cases this treatment is not sufficient and must be combined with block dissection.

In regard to prophylactic treatment the authors believe that it may be omitted in carcinoma of the lip if the patient can be carefully observed. In oral carcinoma they believe that prophylactic irradiation is important.

HAROLD C. OCHSNER M.D.

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be freshly and accurately prepared. Before entering the alcohol basin the hands and arms should be dried thoroughly with a sterile towel for to carry water into alcohol would weaken the solution and markedly lessen its germicidal power. In the alcohol basin the skin should be rubbed firmly with sterile gauze or a wash cloth.

The time spent in these solutions is of the utmost importance. Ethyl alcohol should be used with friction for three minutes by the clock or the mixture of alcohols for two. This may be expected to reduce the original flora from 50 per cent (result of scrubbing) to something less than 2 per cent.

3. Gloves and gown are put on. An ungloved hand inevitably increases the risk of wound infection.

4. Between operations the hands should be washed in a germicidal solution in order to counteract the increase of cutaneous bacteria which has taken place beneath the gloves. A useful rule is one minute in alcohol for every hour that the gloves have been worn.

Preparation of the field of operation. Before coming to the operating room the patient should receive a bath the site of operation being especially well washed with soap and water to remove dirt most of the fats and any transient bacteria. If as in the presence of a wound this is not possible a chemical detergent should be used.

Immediately before the operation the site of the incision should be washed with gauze and 70 per cent (by weight) alcohol or the suggested mixture of alcohols. It should be allowed to dry slowly for in disinfection time is a factor that cannot be ignored.

The alcohol is to be followed by one of the stronger germicides. U. S. P. tincture of iodine (7 per cent) is extremely effective. After application iodine solutions should be permitted to dry slowly. Washing a dried coat of iodine off the skin with alcohol increases rather than diminishes the total germicidal effect.

As an alternative to the iodine technique the field of operation may be painted with Scott's alcohol acetone 2 per cent solution of mercurochrome or an irregular area such as that of a hand or foot may be soaked for a minute in 1:500 biniodide solution. In

either case an aseptic surface will be produced. However the line of incision must be first specially prepared (disinfected) else the knife will necessarily pass through bacteria laden skin beneath the film. One way to do this is to rub the site of incision for two or three minutes firmly with gauze and 70 per cent (by weight) alcohol or the mixture of alcohols.

Disinfection of contaminated hands. It is not difficult to disinfect ordinary hands contaminated by contact with infectious patients or materials. The following method is recommended.

1. The hands should be washed as soon as possible with soap and running water for at least thirty seconds. This may be expected to remove about nine tenths of the contaminating organisms. If there is pus blood secretion from the wound saliva mucus or other infectious material on the hands washing should be continued for a minute or more perhaps with the use of a brush.

2. The hands should be well dried on an individual towel.

3. Every part of the hands should be wet with 70 per cent (by weight) alcohol. A few cubic centimeters dropped on the hands will suffice. The alcohol should not be wiped or shaken off but the skin should be allowed to dry by evaporation. It is the germicidal action that is required and that takes time.

SAMUEL KAHN M.D.

Grodinsky M. Infection and Gangrene of the Extremities in the Diabetic. *Diagnosis and Treatment.* *Am J Surg* 1938 42: 339.

The discussion of this subject is accompanied by 12 case reports. The author emphasizes the necessity of the closest co-operation between the internist and the surgeon. The determination of the form of surgical treatment which varies from the most conservative régime to the most radical high amputation depends upon the extent of infection and the adequacy of the circulation. Simple clinical examination of the pulsation of the peripheral vessels the character of the local lesion the color of the skin and the skin temperature is the best means of determining the status of the circulation.

WALTER H. NADLER M.D.

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